



SONICOR INSTRUMENT CORPORATION

OPERATING INSTRUCTION MANUAL

**MOBILE ULTRASONIC CLEANER
MODEL MSC-900T-11/21**

SONICOR INSTRUMENT CORPORATION

Revised 8710

100 WARTBURG AVENUE COPIAGUE N.Y. 11726

IMPORTANT NOTICE

**BEFORE INSTALLATION OF UNIT
REMOVE REAR PANEL
REMOVE POWER MODULE SECURING
ATTACHMENT
REPLACE REAR PANEL**

TABLE OF CONTENTS

SECTION I	INTRODUCTION & DESCRIPTION	PAGE
1.1	PURPOSE OF MANUAL	1
1.2	GENERAL DESCRIPTION	1
1.3	CONSOLE BASIC COMPONENT ASSEMBLY	1
1.4	BASIC SPECIFICATIONS	2
	PHOTOGRAPH MSC-900T-11/21	3
	FIGURE 1 MOBILE ULTRASONIC CLEANER	4
	FIGURE 2 ACCESSORIES - ULTRASONIC CLEANER	5
SECTION II	INSTALLATION AND STORAGE	
2.1	UNPACKING AND HANDLING	6
2.2	PLACEMENT OF EQUIPMENT	6
2.3	PLUMBING REQUIREMENT	6
2.4	ELECTRICAL REQUIREMENT	6
2.5	INDOOR STORAGE	7
2.6	OUTDOOR STORAGE	7
2.7	STORAGE FACILITY	7
2.8	INSPECTION/MAINTENANCE INSTRUCTION STORAGE	7
SECTION III	OPERATION	
3.1	DESCRIPTION OF OPERATING CONTROL	8
3.1.1	ULTRASONIC CLEAN TIMER DIAL	8
3.1.2	TIMER INDICATOR LAMP	8
3.2	ULTRASONIC CLEANING PRINCIPLE	8
3.3	ULTRASONIC CLEANING DATA	8
3.4	OPERATING INSTRUCTIONS	9
3.4.1	PRECAUTION	
3.4.2	EQUIPMENT SET-UP AND START-UP PROCEDURE	9
3.4.3	CLEANING DATA	10
3.4.3.1	FACTORS THAT DETERMINE SOLUTION LEVEL	10
3.4.3.2	BASKET LOADING INFORMATION	10
3.4.4	CLEANING PROCEDURE	11
3.4.5	SHUT DOWN PROCEDURE	11
SECTION IV	OPERATIONAL MAINTENANCE	
4.1	SERVICE AND TROUBLESHOOTING	12
4.2	PERIODIC INSPECTION	12
4.2.1	PREVENTIVE MAINTENANCE EXTERIOR	12
4.2.2	PREVENTIVE MAINTENANCE INTERIOR	12
4.3	BASIC TROUBLESHOOTING	12
4.3.1	NO ACTIVITY IN TANK	12
4.3.2	POWER MODULE REPLACEMENT INSTRUCTIONS	13
4.3.3	MALFUNCTION ANALYSIS CHART	13
4.4	RETURN OF EQUIPMENT	14
	FIGURE 3 CLEANER ASSEMBLY	15
	TABLE 1 PARTS LIST CLEANER ASSEMBLY	16
	FIGURE 4 SCHEMATIC MSC-900T-11/21	17
SECTION V	GUARANTEE	18

SECTION I
INTRODUCTION & DESCRIPTION

1.1 PURPOSE OF MANUAL

This handbook contains operation and service instructions for Sonicator's Mobile Ultrasonic Cleaner Console Model MSC-900T-11/21.

1.2 GENERAL DESCRIPTION (FIGURE 1 PAGE 4)

The MSC-900T-11/21 is a self contained compact mobile Ultrasonic cleaner unit, complete with ultrasonic generator, transducerized heavy gauge stainless steel tank in a rigid stainless steel cabinet with four locking casters for easy mobility and stationary operation. A 0-60 minute timer control with indicator allows for timed ultrasonic cleaning operation. The unit has a six (6) foot line cord for 115V or 230V electrical input and is fused for overload protection. The compact unit incorporates a 17.5 gallon round cornered stainless steel tank for maximum ultrasonic activity, durability, maintenance and use with water base detergents. Accessories included are Cover, Basket, Drain Valve and Fill Hose.

1.3 CONSOLE BASIC COMPONENT ASSEMBLY (FIGURE 3 PAGE 15)

Cabinet	Polished stainless steel type 304, 18 gauge sides with 16 gauge base. Removable rear panel for easy access to components. The front of the cabinet and rear panel are louvered for ventilation.
Tank	Polished stainless type 304 with round corners, 1"NPT drain to accept external cabinet mounted valve.
Console	Mounted on four (4) lockable 5" diameter adjustable, conductive rubber casters.
Ultrasonic	900 watt generator consisting of three (3) ultrasonic plug-in power modules (Item 16) and eighteen (18) 40kHz lead zirconate composite transducers bonded to tank bottom.
Control	0-60 minute timer with indicator.
Electrical	115V or 230V, single phase input through EMI suppressor, terminal block and transformer with external cabinet fuse and line cord.

1.4 BASIC SPECIFICATIONS MODEL MSC-900T-11/21 (FIGURE 1 PAGE 4)

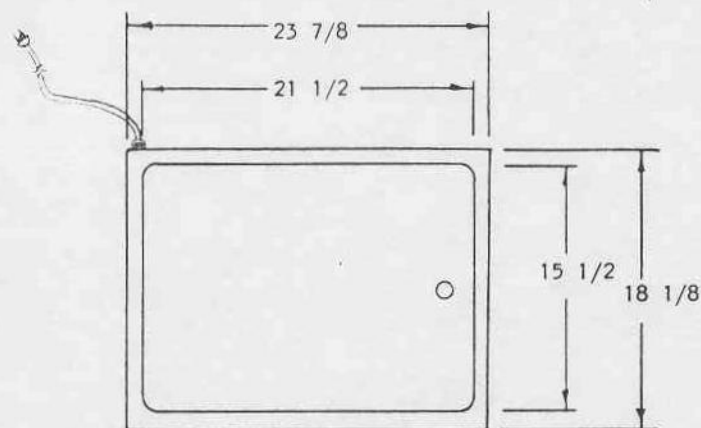
Overall Dimensions LxWxH	23 7/8" x 18 1/8" x 31"	
Cabinet	Material	18 Ga. sides-16 Ga. base 304 polished stainless steel. louvered for ventilation
Ultrasonic Tank	Material	18 Ga type 304 stainless steel round cornered.
	LxWxD	21 1/2" x 15 3/4" x 12"
	Drain	1" NPT
	Capacity	17.5 gallons
Ultrasonic Power		900 Watts, 40KHz solid state plug in modules
Electrical Input		115V,50/60Hz,1PH, 9 Amp
or:		230V,50/60Hz,1PH, 4.5 Amp
Overload Protection		Fuse (externally mounted)
Casters		Four (4) lockable 5"diameter adjustable, conductive rubber
Line cord		Six (6) feet long
Control		Timer 0-60 minute with indicator.

ACCESSORIES (FIGURE 2 PAGE 5)

Cover:	stainless steel lift-off type
Basket:	stainless steel with two handles (18 1/2" x 13 1/2" x 4" Deep)
Fill hose:	5 foot long
Drain valve	

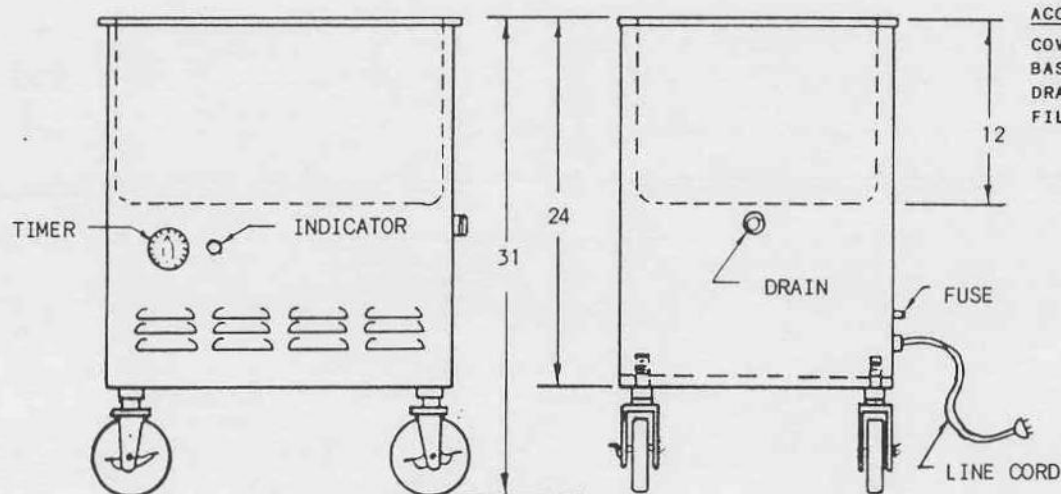


MODEL MSC-900T-11/21



SPECIFICATIONS MODEL MSC-900T-11/21

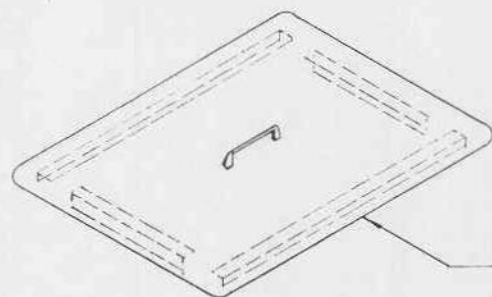
OVERALL DIMENSIONS LxWxH	23 7/8" x 18 1/8" x 31" HIGH
CABINET	18 GA SIDES - 16 GA BASE 304 STAINLESS STEEL POLISHED
TANK	18 GA. 304 STAINLESS STEEL ROUND CORNERED POLISHED
ULTRASONIC TANK LxWxH	21 1/2" x 15 3/4" x 12" DEEP
ULTRASONIC TANK CAPACITY	17.5 GALLONS
MINIMUM SOLUTION DEPTH	6 INCHES
TANK DRAIN	1" NPT
ULTRASONIC POWER	900 WATTS
OPERATING FREQUENCY	40 KHz
ELECTRICAL INPUT:	120 V, 50/60Hz, 1 PH, 9AMP
OR:	230 V, 50/60Hz, 1 PH, 4.5AMP
OVERLOAD PROTECTION	FUSED
CASTERS	FOUR (4) LOCKABLE 5" DIAMETER HEIGHT ADJUSTABLE CONDUCTIVE RUBBER
LINE CORD	SIX (6) FEET LONG
CONTROLS	TIMER 0-60 MINUTES WITH INDICATOR LAMP



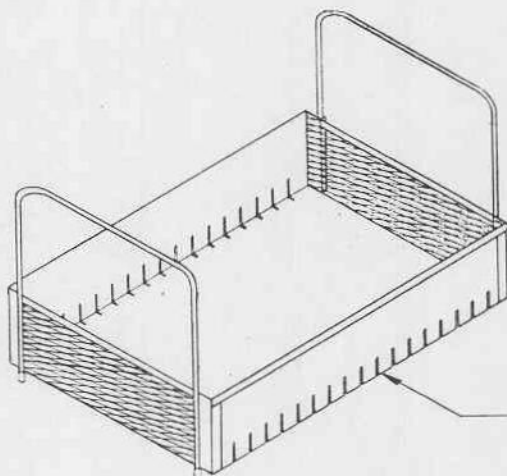
ACCESSORIES (INCLUDED)

COVER STAINLESS STEEL LIFT-OFF TYPE
 BASKET STAINLESS STEEL WITH TWO (2) HANDLES (18 1/2x13 1/2x4 DEEP)
 DRAIN VALVE
 FILL HOSE FIVE(5) FEET LONG

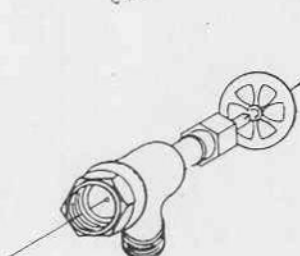
MOBILE ULTRASONIC CLEANER
 MODEL MSC-900T-11/21
 FIGURE 1



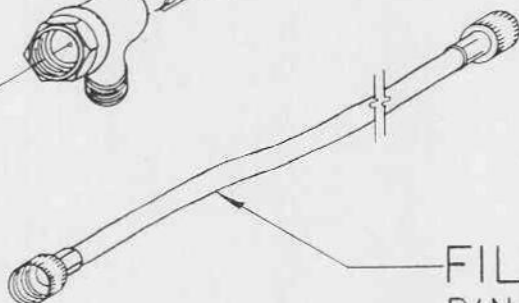
COVER
P/N F320436



BASKET
P/N F320437



DRAIN VALVE
P/N 620559



FILL HOSE
P/N 670307

ACCESSORIES FOR ULTRASONIC CLEANER
MODEL MSC-900T
FIGURE 2

SECTION II
INSTALLATION AND STORAGE

2.1 UNPACKING AND HANDLING

Normal precautions in unpacking and reasonable care in handling, should be employed to avoid possible damage to the system. A visual inspection of all internal and external components and surfaces should be conducted to detect any damage which may have occurred during shipment. Retain container and packing material for subsequent reshipping and/or storage.

2.2 PLACEMENT OF EQUIPMENT

The unit should be placed where the rear of unit is at least six (6) inches from the wall or any obstruction. An undisturbed air flow from the rear to the front should always be maintained in order to keep the components at a safe operating temperature. Periodically check the air intake louvers to insure that dust, dirt or paper is not restricting the air flow. Clean as needed. The unit should be located near a sink for easy filling and disposal of contaminated solution.

2.3 PLUMBING REQUIREMENTS

Install a 1" NPT valve for drainage of tank solution. Locate unit near a source of warm water. The Fill Hose can be utilized for filling from a 3/4" hose fitting faucet.

2.4 ELECTRICAL REQUIREMENT (FIGURE 4 PAGE 17)

It is recommended that the unit be connected to a fused disconnect power box (circuit breaker), capable of accommodating the electrical requirement of the unit. The electrical requirement is stated on the serial and identification plate. The serial plate states the model number, serial number, voltage, phase, cycle and amperage. It is located next to the line cord, on the rear of the unit. The identification plate which is located on the front includes the model number, serial number, date, voltage, phase, hertz, NSN and FSCM

The MSC-900T-11/21 is equipped to accommodate either 115 volt or 230 volt, 50/60Hz single phase electrical input. For the desired voltage make simple quick disconnect connections described below and indicated on the wiring schematic (Figure 4 page 17) making sure to install the appropriate fuse and plug on line cord, if other than 115V input.

115 Volt, 50/60Hz, 1PH, Electrical Input

Connect red lead (push on lug) to terminal block position #4.
Connect gray lead (push on lug) to terminal block position #1.
Requires P/N 820512 12 Amp Fuse. Unit equipped with 115V plug.

230 Volt, 50/60Hz, 1PH, Electrical Input

Connect red lead (push on lug) to terminal block position #2.
Connect gray lead (push on lug) to terminal block position #3.
Requires P/N 820506 6 Amp Fuse. Install appropriate plug.

2.5 INDOOR STORAGE

1. Unplug the line cord, roll it into a small circle and secure it.
2. Drain the chamber.
3. Clean out residue inside tank, drain pipe and valve and wipe tank interior with soft cloth.
4. Wipe the outside of the console, of any solution that may have spilled, using soft cloth.
5. Remove console rear access panel.
6. Clean the interior of the generator housing and module(s) with the aid of a vacuum and/or a soft brush if required.
7. Replace console rear panel.
8. Protect the outer cabinet surface with a waterproofing stainless steel polish.
9. Protect the console with a plastic cover.
10. Before moving (rolling) release caster brakes.
11. Storage facilities environmental limitation temperature 0-125 Deg. F. humidity: 70 percent relative humidity for one year.

2.6 OUTDOOR STORAGE

1. Unplug the line cord, roll it into a small circle and secure it.
2. Drain the chamber.
3. Clean out residue inside tank, drain pipe and valve and wipe tank interior with soft cloth.
4. Wipe the outside of the console, of any solution that may have spilled using soft cloth.
5. Remove console rear access panel.
6. Clean the interior of the generator housing and module(s) with the aid of a vacuum and/or a soft brush if required.
7. Replace console rear panel.
8. Protect the outer cabinet surface with a waterproofing stainless steel polish.
9. Environmentally seal the console, including the casters.
10. Environment limitation humidity: 70 percent relative humidity, temperature 0-125 Deg F. for six months.

2.7 STORAGE FACILITY (INDOOR)

Storage should be protected from the elements such as water, dampness, and insects.(refer to 2.5).

2.8 INSPECTION/MAINTENANCE INSTRUCTION WHILE UNIT IN STORAGE (INDOOR)

1. Remove plastic covering.
2. Remove console rear panel.
3. Check for corrosion due to moisture. Remove corrosion and protect affected areas.
4. Remove and inspect each power module.
5. Clean and protect cabinet surface with waterproofing stainless steel polish.
6. Replace rear panel.
7. Replace plastic cover.

SECTION III OPERATION

3.1 DESCRIPTION OF OPERATING CONTROL

3.1.1 TIMER DIAL:(FIGURE 1 PAGE 4)

The Timer Dial energizes the ultrasonic generator and provides for 0-60 minute timed ultrasonic cleaning. To operate turn dial clockwise past 10 then set time.

3.1.2 TIMER INDICATOR LAMP: (FIGURE 1 PAGE 4)

The lamp will illuminate when timer is energized.

3.2 ULTRASONIC CLEANING PRINCIPLE

Ultrasonic cleaning is the rapid and complete removal of contaminants from objects by immersing them in a tank of liquid flooded with ultra high frequency sound waves. These non audible sound waves cause the liquid to act as its own scrub brush. High frequency electrical energy is produced by an ultrasonic generator. Transducers intimately bonded to tank bottom, converts electrical energy into high frequency sound energy. The ultrasonic energy enters the liquid in the tank and causes the rapid formation and collapse of minute bubbles, a phenomenon known as cavitation. The bubbles, traveling at high speed, implode on the parts immersed in the liquid solution, thus cleaning both the surfaces and inner most recesses of any intricately shaped parts.

3.3 ULTRASONIC CLEANING DATA

Ultrasonic cleaning was developed to provide a modern, safe and effective method of cleaning all types of parts. The cleaning of parts requires that penetration occurs on the surface and into the inner most areas of intricately shaped parts and subassemblies.

To accomplish proper cleaning, attention to key factors is important:

1. TIME
2. TEMPERATURE
3. CHEMISTRY
4. CONCENTRATION

Each of these factors should be researched to formulate the best cleaning method for any particular application.

1. Time -- Cleaning time will depend on the amount, location, and type of soil to be removed. While most surface soils can be removed instantaneously, heavy soil imbedded in the cracks, crevices, pores, and parts that are layered will increase cleaning time. A properly designed basket or rack is extremely important in getting maximum ultrasonic efficiency and productivity. Never overload a basket because fewer parts are cleaned faster and better.

2. Temperature - Temperature of a liquid affects both cavitation quality and chemical cleaning reaction. Both can usually be improved by increasing operating temperature above room temperature. However there is an ideal temperature at which cavitation intensity is greatest. This optimum temperature varies in liquids according to their properties. Aqueous detergent solutions usually cavitate best within the range of 100 to 160 degrees F. At temperatures above 160 degrees F, cavitation may diminish.

3. Chemistry -- Match the chemistry to the contaminants and parts to be cleaned. Select the cleaning solution that will best remove the soils without affecting the items being cleaned and has good cavitation properties. Never use a chemical that attacks the part, tank materials or inhibits ultrasonic cavitation.

4. Concentrations --Chemical concentration is a definite factor in the cleaning process. Use the recommended concentrations listed on the container. Higher concentration can cause damage to parts and equipment. In some instances high concentration of chemicals will inhibit ultrasonic activity. Only recommended concentrations listed on the container should be used.

3.4 OPERATING INSTRUCTIONS

3.4.1 PRECAUTION / LIMITATION

1. Do not use chemical solution that would attack type 304 SS
2. Do not use volatile toxic or flammable solvents.
3. Do not place fingers in tank while the ultrasonics are ON.
4. Never operate the tank without six inches of solution depth.
5. Always experiment on a sample, when cleaning a new part.
6. Rinse parts after cleaning for best result.
7. Size limitation of work should not exceed 30 percent of the displaced working volume of liquid in the cleaning chamber.
8. The weight limitation of the tank should not exceed 80 pounds and must be able to fit into the basket.

3.4.2 EQUIPMENT SET-UP AND START-UP PROCEDURE

1. Check the electrical installation requirement, 115V or 230V.
2. Turn Timer knob to "0"
3. Close drain valve. (Installation ref. section 2.3 page 6)
4. Place unit where it is to be used (Refer. section 2.2 page 6) locking at least two caster brakes.
5. Fill chamber with fourteen (14) gallons of warm water. Add two (2) quarts SONICOR No. 105 Surgical Instrument Cleaner Detergent. This will allow for a nominal two (2) inch free board. CAUTION: It is recommended that the unit be moved only when empty to avoid splashing and spillage.
6. Plug line cord into electrical source.
7. Turn the Ultrasonic Timer Knob to 15 minutes, (turn clockwise). The indicator lamp will illuminate as the Timer knob is turned.

- a. At this point, the solution will go through a process called Degassing, which is the releasing of entrapped air from the cleaning solution. This process should take between ten (10) to fifteen (15) minutes before full Ultrasonic efficiency is achieved. Degassing should be performed after fresh solution and whenever the solution has been stagnant over a long period of time.
 - b. There will be a buzzing and/or squealing sound coming from the Ultrasonic chamber signifying the presence of Ultrasonic energy in the chamber. The buzzing /squealing sound will vary throughout the operation as well as the ripples on the surface. These conditions have no bearing on the efficiency of the Cleaner, but serve as visual and audible indicators. When parts are in the chamber the buzzing sound is reduced. Violent movement of liquid will cause a squealing sound. Therefore, always lower and remove basket slowly.
8. Check the Generator section to insure that the LED indicator lamp on each power module is glowing. This indicates proper functioning and is observed by removal of cabinet rear panel.
 9. At end of timer cycle, the ultrasonics will automatically turn OFF. Unit is now ready for operation.
 10. It is a good policy to remove the AC connection whenever unit is not being used.

3.4.3 CLEANING DATA

Once installation and set-up/start-up procedure is completed, the unit is ready to process parts.

CAUTION: NEVER OPERATE UNIT WITHOUT LIQUID.

3.4.3.1 FACTORS THAT DETERMINE THE LEVEL OF SOLUTION

- a. Minimum solution depth of six (6) inches.
- b. Add additional liquid (if necessary) so that the solution level is at least 1 1/2" above the height of the parts.
- c. Normal operation will be to fill tank with warm water to 2 1/2" from top and add two (2) quarts of SONICOR No. 105 Detergent for cleaning of surgical instruments.
- d. Always degas fresh solution for a minimum of ten (10) minutes before cleaning parts.

3.4.3.2 BASKET LOADING INFORMATION

- a. Open all jointed articles for maximum exposure of joint, jaw, blade, and lock surfaces.
- b. Place items in basket one at a time, positioned and stacked for maximum surface exposure. Use a crisscrossed layer pattern with each layer in opposite direction to avoid closely packed or dense areas. Place the longer and heavier items on the bottom. For maximum cleaning performance, use additional basket loads rather than overloading a single basket. Fewer parts are cleaned faster and better.

3.4.4 CLEANING PROCEDURE

1. Rinse the part(s) thoroughly with warm water prior to immersing them in the ultrasonic chamber. Rinsing off loose contaminants keeps the Ultrasonic Cleaning Chamber and the cleaning solution cleaner and fresher. This will improve the cleaning process and extend the life of the cleaning agent.
2. Carefully place the part(s) (refer to 3.4.3.2) in the basket and lower slowly into the Ultrasonic chamber. Try not to scratch the side walls or bottom and NEVER drop anything on tank bottom.
3. Rotate the timer knob to set the desired time cycle.
4. Allow the part(s) to be permeated with the Ultrasonic energy for required time cycle. A sample cleaning of parts will enable determination of the best cleaning time.
5. At end of Time cycle the ultrasonics will go OFF.
6. Carefully and slowly remove the basket of the cleaned parts from the Ultrasonic Chamber. Try not to scratch the side walls.
7. Rinse the cleaned parts thoroughly with warm to hot water.
8. Repeat procedure for next batch.

3.4.5 SHUT DOWN PROCEDURE

1. If the solution is to be reused, place the cover on the console.
2. If solution is to be disposed of, open the drain valve and dispose of spent cleaning solution. CAUTION Never open the drain valve unless the Timer is at "0" and ultrasonic generator is OFF.
3. Rinse the residue from the Cleaning Chamber.
4. Wipe down the inside and outside surface with a soft damp cloth.
5. Place lift-off cover on unit
6. For storage refer to section 2.5 or 2.6 page 7.

SECTION IV
OPERATIONAL MAINTENANCE

4.1 SERVICE AND TROUBLESHOOTING

Unless the operational specialist is familiar with the system's electrical and operational characteristics, it is recommended that assistance be obtained.

4.2 PERIODIC INSPECTION

4.2.1 PREVENTIVE MAINTENANCE EXTERIOR(OPERATOR)

Wipe the outside of the system and clean up any solution that has spilled. Every week, or as often as necessary clean out residue inside drain pipe and valve. Inspect line cord. It should be free from cracks, cuts and extreme brittleness. Check fuse holder to insure that its secure.

4.2.2 PREVENTIVE MAINTENANCE INTERIOR(TECHNICIAN)

In order to minimize any down time of the Ultrasonic Cleaning Console, a periodic interior maintenance/inspection should be conducted. Disconnect power to the Console. Remove cabinet rear access panel. Due to the constant flow of air through the generator section, dirt may accumulate upon the components. With the aid of a vacuum or soft brush, clean the interior of the generator module housing and modules. Care should be exercised not to damage or disengage any components. Visually inspect all wires and check connections for good continuity. Replace Cleaner rear access panel. The Console is ready for operation.

4.3 BASIC TROUBLESHOOTING(TECHNICIAN)

To aid personnel in identifying various components and locating connection points Figure 3 page 15 with Table 1 page 16 and Figure 4 page 17 are provided for assistance.

Always be sure that power is disconnected to system during inspection and/or removal of components unless it is necessary to observe the Power Module LED indicator or check of a component failure.

4.3.1 NO ACTIVITY IN THE ULTRASONIC TANK (TECHNICIAN)

- a. Check that there is power to the unit.
- b. Check cabinet fuse (rear of unit)
- c. Remove rear panel and with the line cord connected, turn the unit ON. Check that the LED indicators on each Power Module is glowing. If indicators are not glowing, the Power Module(s) should be replaced, but not before checking step "e" and reference malfunction analysis chart.
- d. Turn the unit OFF. disconnect line cord.
- e. Check that all wires are properly connected from Transducers to Power Modules, fan motors, terminal block, fuse post, EMI assembly, timer and timer indicator. Inspect for solution leakage and arcing of transducers and internal components.

4.3.2 POWER MODULE REPLACEMENT INSTRUCTIONS (TECHNICIAN)

- a. If after comprehensive inspection, it is concluded that Power Module(s) is defective, the following procedure is necessary for the removal and reinstallation of power module(s).
- b. With the rear panel removed and line cord plug disconnected, unplug the two (2) RF output leads on the module(s). One is green and the other can be either red, yellow and/or white.
- c. Remove module by pulling toward rear of cabinet. The module is on slides and plugs into the housing socket.
- d. To install a power module reverse removal procedure, visually inspect all connections.
- e. With rear panel off make sure there is a minimum of six (6) inches of water and detergent in the tank, plug in line cord, turn time switch to 15 minutes and observe that the module LED's are glowing and there is activity in the tank.
- f. If preceding step "e" satisfactory, turn off timer, unplug line cord and replace cabinet rear panel. Unit ready for use.
- g. If preceding step "e" unsatisfactory, shut off timer, unplug line cord, replace rear panel notify maintenance specialist

4.3.3 MALFUNCTION ANALYSIS CHART(TECHNICIAN)

The chart is a detailed symptom aid in diagnosing and locating a defective component or assembly. Notify maintenance specialist.

SYMPTOM	PROBABLE CAUSE
MAIN POWER FUSE FAILED.	1. UNDER RATED FUSE 2. INCORRECT VOLTAGE
INDICATOR LAMP FAILS TO ILLUMINATE WHEN TIMER IS ENERGIZED.	1. UNPLUGGED UNIT 2. DEFECTIVE LINE CORD 3. DEFECTIVE TIMER 4. DEFECTIVE FUSE 5. DEFECTIVE INDICATOR
FAN(S) DO NOT OPERATE WHEN TIMER IS ENERGIZED LIGHT ILLUMINATES.	1. LOOSE OR BROKEN WIRE TO FAN 2. DEFECTIVE FAN MOTOR
FUSE FAILS WHEN TIMER IS ENERGIZED.	1. UNDERRATED FUSE 2. INCORRECT VOLTAGE 3. DEFECTIVE TRANSFORMER 4. SHORT IN WIRING
LOW ACTIVITY IN TANK. TIMER ENERGIZED INDICATOR ILLUMINATES AND FAN(S) OPERATE.	1. SOLUTION HAS NOT BEEN DEGASSED 2. SOLUTION DOES NOT CONTAIN WETTING AGENT (CLEANING CHEMICAL) 3. SOLUTION IS EXCESSIVELY CONTAMINATED 4. SOLUTION HAS NOT REACHED OPERATING TEMPERATURE 5. LOW INPUT VOLTAGE 6. MODULE(S) HAS FAILED

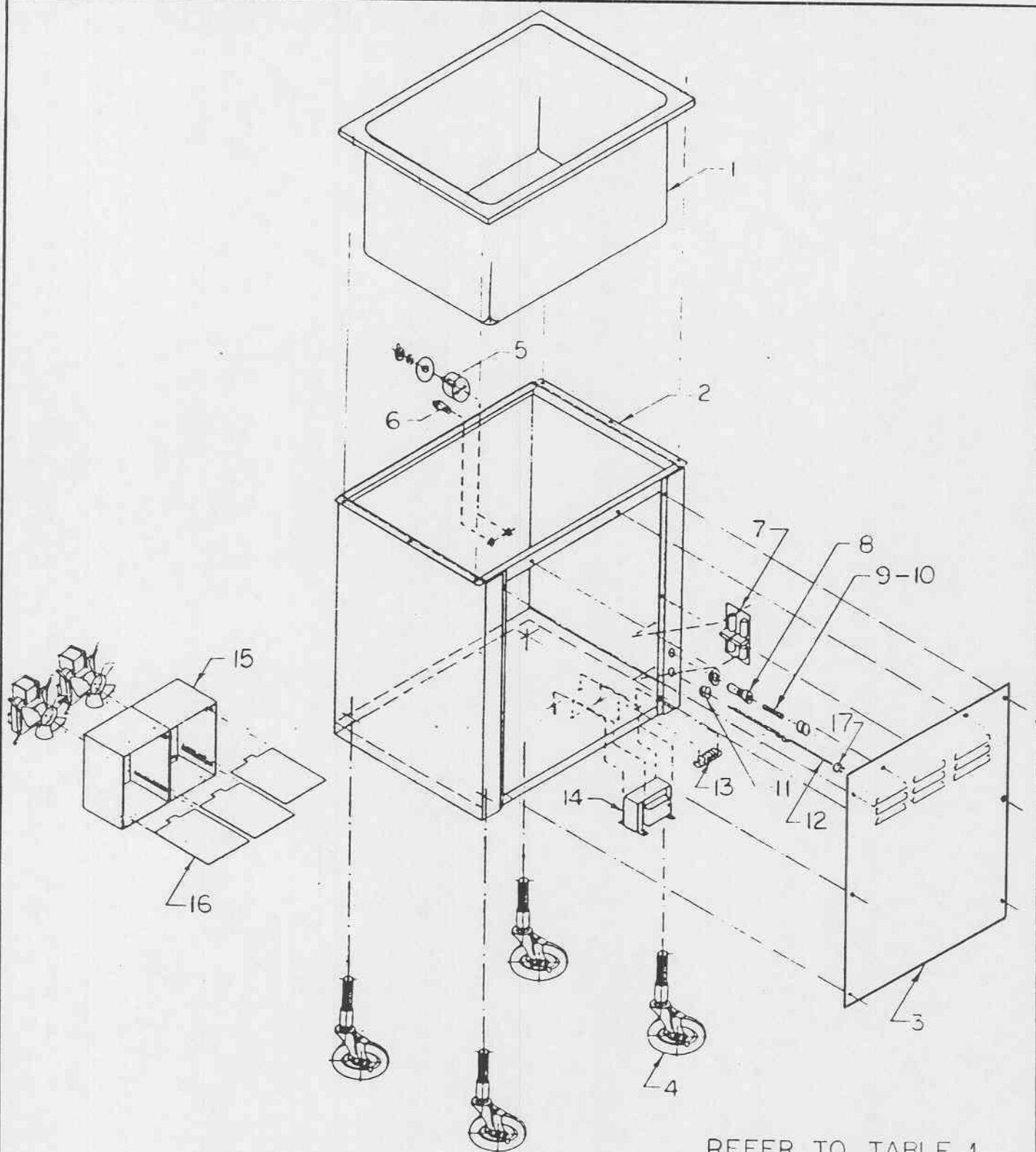
NO ACTIVITY IN TANK.
TIMER ENERGIZED INDICATOR
ILLUMINATES. FAN(S) OPERATE.

1. SHORT IN RF WIRING
2. CHECK POWER MODULE(S)

4.4 RETURN OF EQUIPMENT

The system has been designed for reliable, trouble free performance. After prolonged use, should a field unrepairable malfunction occur, return the system or assembly to the factory. But first contact SONICOR service department and proceed with the following steps to insure prompt attention and service:

1. Specify date of purchase, model and serial number.
2. Provide efficient packing to insure against damage during shipment.
3. Send equipment prepaid and indicate method of return shipment.



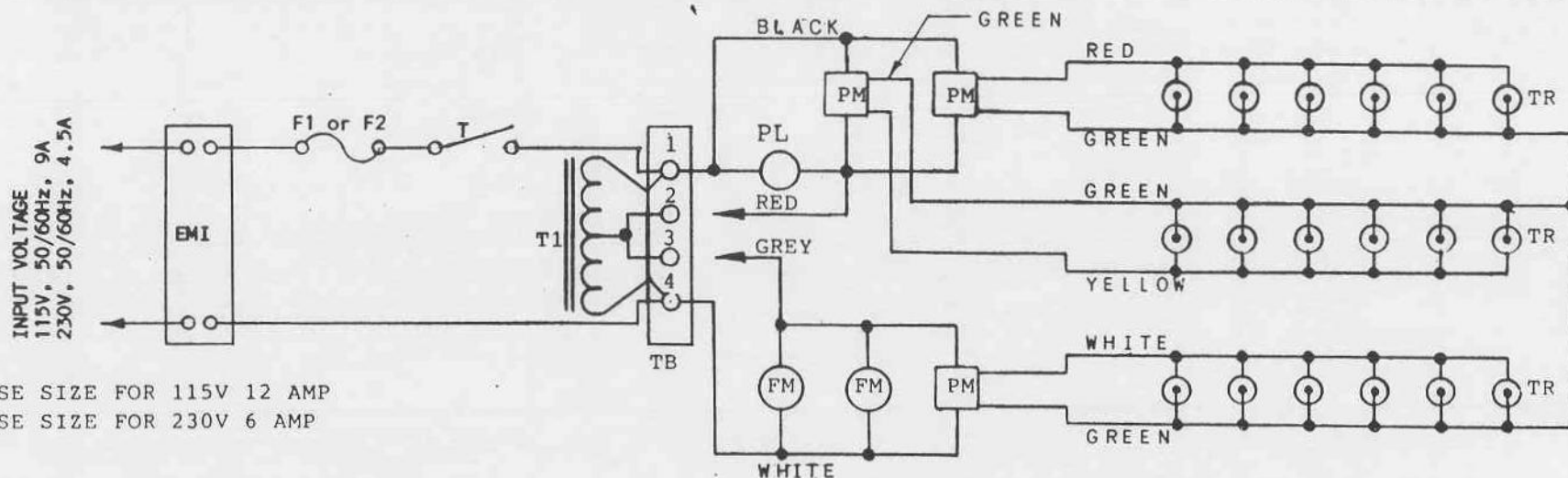
REFER TO TABLE 1

CLEANER ASSEMBLY
MODEL MSC-900T-11/21
FIGURE 3

FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNIT PER ASSY
3-17	--	ULTRASONIC CLEANER MSC-900T-11/21	REF
-1	S360521	TANK ASSEMBLY	1
-2	F302271	CABINET	1
-3	F302262	REAR PANEL	1
-4	S870223	CASTER/ADAPTOR ASSEMBLY	4
-5	S821012	TIMER (0-60 MINUTES) ASSEMBLY	1
-6	800101	PILOT LAMP	1
-7	S430074	EMI SUPPRESSOR	1
-8	820553	FUSE HOLDER ASSEMBLY	1
-9	820512	FUSE (12 AMP 115 VOLTS)	1
-10	820506	FUSE (6 AMP 230 VOLTS)	1
-11	850162	STRAIN RELIEF LINE CORD	1
-12	830013	LINE CORD	1
-13	841514	TERMINAL BLOCK	1
-14	410104	TRANSFORMER	1
-15	S250061	MODULE HOUSING ASSEMBLY	2
-16	S420475	POWER MODULE	3
-17	600001	PLUG, 115 VOLT	1

REFERENCE FIGURE 3
 ULTRASONIC CLEANER ASSEMBLY PARTS LIST
 MODEL MSC-900T-11/21

TABLE I



F1 FUSE SIZE FOR 115V 12 AMP
F2 FUSE SIZE FOR 230V 6 AMP

FIGURE & SYMBOL	PART NUMBER	DESCRIPTION	UNITS PER ASSY
4-	--	ULTRASONIC CLEANER SCHEMATIC	REF
-PM	S420475	POWER MODULE	3
-FM	890005	FAN MOTOR ASSY	2
-PL	800101	PILOT LIGHT	1
-T	S821012	TIMER	1
-EMI	S430074	EMI SUPPRESSOR	1
-F1	820512	FUSE 12 AMP	1
-F2	820506	FUSE 6 AMP	1
-T1	410104	TRANSFORMER	1
-TB	841514	TERMINAL BLOCK	1
-TR	S590151	TRANSDUCER	18

INPUT TERMINAL CONNECTION
FOR: 115V CONNECT RED TO No.4
GRAY TO No.1
FUSE F1

FOR: 230V CONNECT RED TO No.2
GRAY TO No.3
FUSE F2

INSTALL APPROPRIATE PLUG
ON LINE CORD

ULTRASONIC CLEANER SCHEMATIC
MODEL MSC-900T-11/21
FIGURE 4

GUARANTEE

Your equipment has passed rigid quality controlled inspection at each stage of assembly. It has been life-tested under actual working conditions prior to shipment. The factory guarantees the equipment for one (1) year after date of purchase against failures due to defective material and/or workmanship. During the guarantee period, the factory will replace and/or repair any defective parts or defect in workmanship which may appear during normal and proper use of the equipment. Service and parts supplied by unauthorized sources will void the guarantee. During the guarantee period, there will be a handling charge only for repairs described above. Defective equipment must be returned prepaid to the factory. Collect shipments to the factory will not be accepted unless previously authorized.

The factory does not guarantee assemblies such as pumps and refrigeration units purchased from other manufacturers. The factory will honor the specific guarantee of the individual manufacturer involved.

There is no guarantee against cavitation erosion of Tank and Transducer surfaces, which is a normal occurrence and develops as a function of time in the operation of Ultrasonic Cleaning Equipment.

The factory does not honor the guarantee on equipment subjected to misuse, improper installation, alteration, neglect or accident.

No warranties, expressed or implied, have been made other than those stated herein. Seller hereby disclaims any warranty of merchantability or warranty of fitness for a particular purpose.



SONICOR INSTRUMENT CORPORATION

MAINTENANCE MANUAL

MOBILE ULTRASONIC CLEANER MODEL MSC-900T-11/21

SONICOR INSTRUMENT CORPORATION

Revised 0990

100 WARTBURG AVENUE COPIAGUE N.Y. 11726

TABLE OF CONTENTS

SECTION I	INTRODUCTION & DESCRIPTION	PAGE
1.1	PURPOSE OF MANUAL	1
1.2	GENERAL DESCRIPTION	1
1.3	CONSOLE BASIC COMPONENT ASSEMBLY	1
1.4	BASIC SPECIFICATIONS	2
	PHOTOGRAPH MSC-900T-11/21	3
	FIGURE 1 MOBILE ULTRASONIC CLEANER	4
	FIGURE 2 ACCESSORIES - ULTRASONIC CLEANER	5
SECTION II	INSTALLATION AND STORAGE	
2.1	UNPACKING AND HANDLING	6
2.2	PLACEMENT OF EQUIPMENT	6
2.3	PLUMBING REQUIREMENT	6
2.4	ELECTRICAL REQUIREMENT	6
2.5	INDOOR STORAGE	7
2.6	OUTDOOR STORAGE	7
2.7	STORAGE FACILITY	7
2.8	INSPECTION/MAINTENANCE INSTRUCTION STORAGE	7
SECTION III	OPERATION	
3.1	DESCRIPTION OF OPERATING CONTROL	8
3.1.1	ULTRASONIC CLEAN TIMER DIAL	8
3.1.2	TIMER INDICATOR LAMP	8
3.2	ULTRASONIC CLEANING PRINCIPLE	8
3.3	ULTRASONIC CLEANING DATA	8
3.4	OPERATING INSTRUCTIONS	9
3.4.1	EQUIPMENT SET-UP AND START-UP PROCEDURE	9
3.4.2	CLEANING DATA	10
3.4.2.1	FACTORS THAT DETERMINE SOLUTION LEVEL	10
3.4.2.2	BASKET LOADING INFORMATION	10
3.4.3	CLEANING PROCEDURE	11
3.4.4	SHUT DOWN PROCEDURE	11
SECTION IV	OPERATIONAL MAINTENANCE	
4.1	SERVICE AND TROUBLESHOOTING	12
4.2	PERIODIC INSPECTION	12
4.2.1	PREVENTIVE MAINTENANCE EXTERIOR	12
4.2.2	PREVENTIVE MAINTENANCE INTERIOR	12
4.3	BASIC TROUBLESHOOTING	12
4.3.1	NO ACTIVITY IN TANK	12
4.3.2	POWER MODULE REPLACEMENT INSTRUCTIONS	13
4.3.3	MALFUNCTION ANALYSIS CHART	13
4.4	RETURN OF EQUIPMENT	14
	FIGURE 3 CLEANER ASSEMBLY	15
	TABLE 1 PARTS LIST CLEANER ASSEMBLY	16
	FIGURE 4 SCHEMATIC MSC-900T-11/21	17

SECTION V	COMPONENT REPLACEMENT INSTRUCTIONS	PAGE
5.0	COMPONENT REPLACEMENT INSTRUCTIONS	18
5.1	POWER MODULE REPLACEMENT	18
5.2	TIMER REPLACEMENT	18
5.3	PILOT LAMP REPLACEMENT	19
5.4	FUSE REPLACEMENT	19
5.5	TRANSFORMER REPLACEMENT	19
5.6	FAN MOTOR ASSEMBLY REPLACEMENT	20
5.7	EMI ASSEMBLY REPLACEMENT	20
5.8	ULTRASONIC TANK REPLACEMENT	20
5.9	CASTER ASSEMBLY REPLACEMENT	21
5.10	DRAIN VALVE REPLACEMENT	21
5.11	WIRE HARNESS REPLACEMENT	21
	FIGURE 5 TIMER ASSEMBLY	22
	FIGURE 6 COMPONENT PART NUMBER	23
	FIGURE 7 TRANSFORMER / TERMINAL BLOCK	24
	FIGURE 8 MODULE HOUSING ASSEMBLY	25
	FIGURE 9 EMI SUPP. ASS'Y AND COVER	26
	FIGURE 10 TANK ASSEMBLY	27
	FIGURE 11 CASTER ADAPTOR	28
	FIGURE 12 DRAIN VALVE WASHER KIT	29
	FIGURE 13 WIRING HARNESS	30
SECTION VI	POWER MODULE SERVICE AND REPAIR	PAGE
6.0	POWER MODULE SERVICE AND REPAIR	31
6.1	DESCRIPTION OF POWER MODULE	31
6.2	THEORY OF OPERATION	31
6.3	TROUBLESHOOTING POWER MODULE	32
6.4	POWER MODULE CHECKOUT	32
6.5	REPAIR AND REPLACEMENT TECHNIQUES	33
6.5.1	COMPONENT REMOVAL	33
6.5.2	COMPONENT REPLACEMENT	33
6.5.3	SOLDERING PROCEDURE	33
6.5.4	REPAIR OF BROKEN COPPER CONDUCTOR LANDS	34
	FIGURE 14 POWER MODULE ASSEMBLY	35
	FIGURE 15 POWER MODULE SCHEMATIC	36
	TABLE 2 POWER MODULE PARTS LIST	37
	TABLE 3 TRANSISTOR & DIODE TROUBLESHOOTING CHART	38
	FIGURE 16 TEST INSTRUMENTATION SCHEMATIC	39
	DISPLAY 1A & 1B	40
	DISPLAY 2A & 2B	41
	DISPLAY 3A & 3B	42
	DISPLAY 4A & 4B	43

SECTION VII

TRANSDUCERS

PAGE

7.0	TRANSDUCER	44
7.1	DESCRIPTION OF TRANSDUCER	44
7.2	THEORY OF OPERATION	44
7.3	ILLUSTRATED PARTS BREAKDOWN	44
7.4	TROUBLESHOOTING	44
7.5	TRANSDUCER REPAIR	44
7.6	TANK DISASSEMBLY FROM CABINET	44
7.7	REMOVAL OF LZT CERAMIC	45
7.8	TRANSDUCER ASSEMBLY REPLACEMENT	45
	FIGURE 17 TRANSDUCER ASSEMBLY	47

GUARANTEE

48

SECTION I
INTRODUCTION & DESCRIPTION

1.1 PURPOSE OF MANUAL

This handbook contains operation and service instructions for Sonicator's Mobile Ultrasonic Cleaner Console Model MSC-900T-11/21.

1.2 GENERAL DESCRIPTION (FIGURE 1 PAGE 4)

The MSC-900T-11/21 is a self contained compact mobile Ultrasonic cleaner unit, complete with ultrasonic generator, transducerized heavy gauge stainless steel tank in a rigid stainless steel cabinet with four locking casters for easy mobility and stationary operation. A 0-60 minute timer control with indicator allows for timed ultrasonic cleaning operation. The unit has a six (6) foot line cord for 115V or 230V electrical input and is fused for overload protection. The compact unit incorporates a 17.5 gallon round cornered stainless steel tank for maximum ultrasonic activity, durability, maintenance and use with water base detergents. Accessories included are Cover, Basket, Drain Valve and Fill Hose.

1.3 CONSOLE BASIC COMPONENT ASSEMBLY (FIGURE 3 PAGE 15)

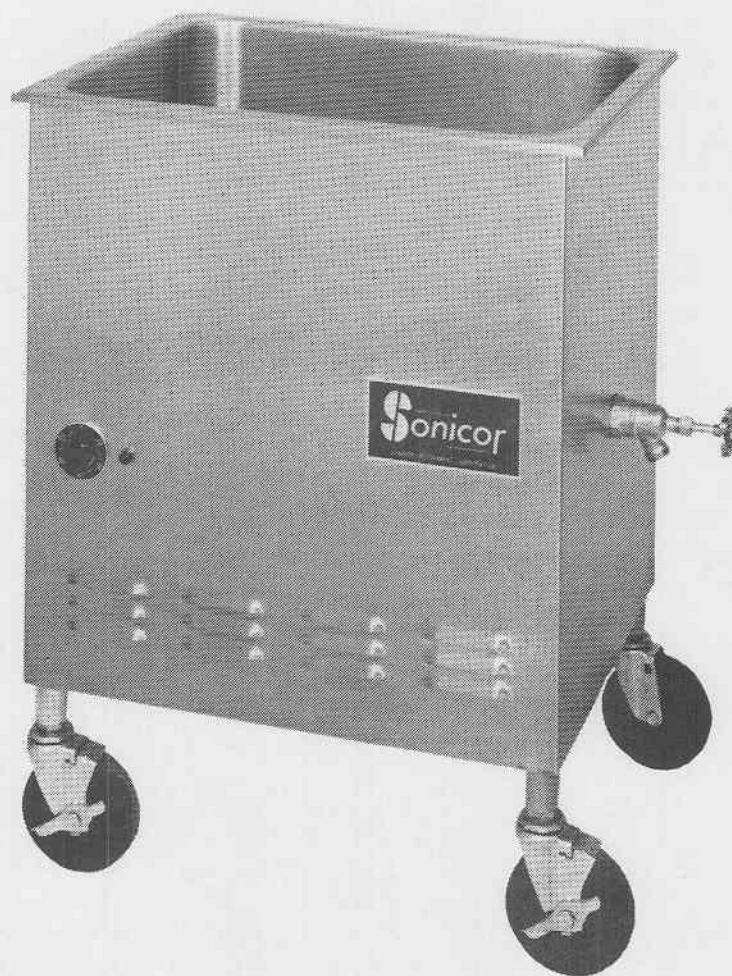
Cabinet	Polished stainless steel type 304, 18 gauge sides with 16 gauge base. Removable rear panel for easy access to components. The front of the cabinet and rear panel are louvered for ventilation.
Tank	Polished stainless type 304 with round corners, 1"NPT drain to accept external cabinet mounted valve.
Console	Mounted on four (4) lockable 5" diameter adjustable, conductive rubber casters.
Ultrasonic	900 watt generator consisting of three (3) ultrasonic plug-in power modules (Item 16) and eighteen (18) 40kHz lead zirconate composite transducers bonded to tank bottom.
Control	0-60 minute timer with indicator.
Electrical	115V or 230V, single phase input through EMI suppressor, terminal block and transformer with external cabinet fuse and line cord.

1.4 BASIC SPECIFICATIONS MODEL MSC-900T-11/21 (FIGURE 1 PAGE 4)

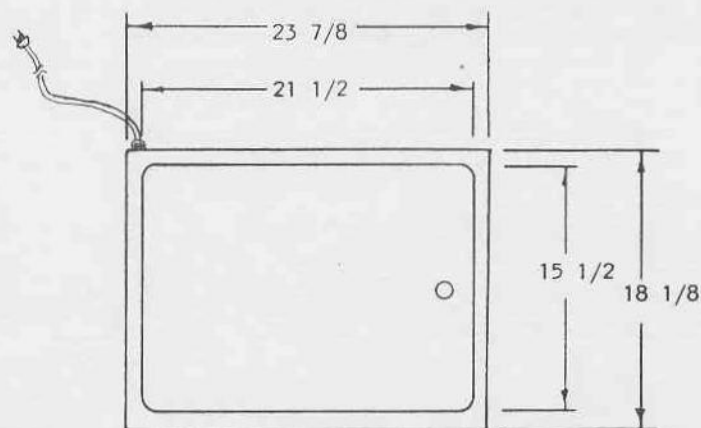
Overall Dimensions	LxWxH	23 7/8" x 18 1/8" x 31"
Cabinet	Material	18 Ga. sides-16 Ga. base 304 polished stainless steel. louvered for ventilation
Ultrasonic Tank	Material	18 Ga type 304 stainless steel round cornered.
	LxWxD	21 1/2" x 15 3/4" x 12"
	Drain	1" NPT
	Capacity	17.5 gallons
Ultrasonic Power		900 Watts, 40KHz solid state plug in modules
Electrical Input		115V, 50/60Hz, 1PH, 9 Amp
or:		230V, 50/60Hz, 1PH, 4.5 Amp
Overload Protection		Fuse (externally mounted)
Casters		Four (4) lockable 5" diameter adjustable, conductive rubber
Line cord		Six (6) feet long
Control		Timer 0-60 minute with indicator.

ACCESSORIES (FIGURE 2 PAGE 5)

Cover:	stainless steel lift-off type
Basket:	stainless steel with two handles (18 1/2" x 13 1/2" x 4" Deep)
Fill hose:	5 foot long
Drain valve	



MODEL MSC-900T-11/21

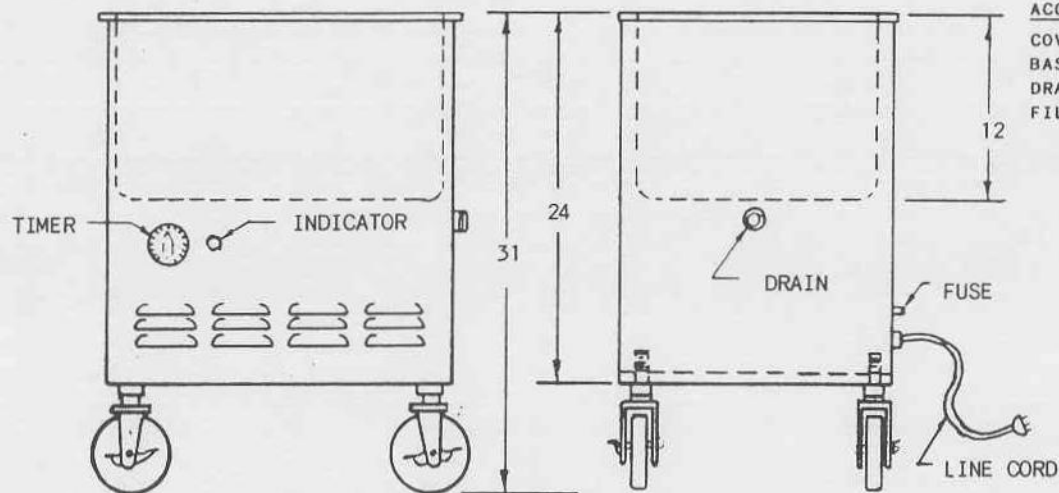


SPECIFICATIONS MODEL MSC-900T-11/21

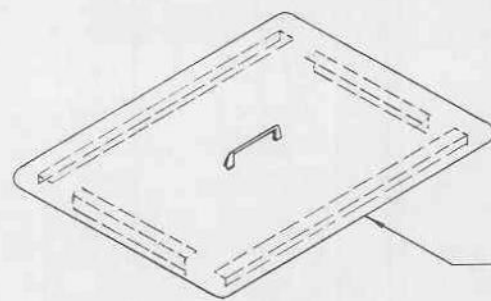
OVERALL DIMENSIONS LxWxH	23 7/8" x 18 1/8" x 31" HIGH
CABINET	18 GA SIDES - 16 GA BASE 304 STAINLESS STEEL POLISHED
TANK	18 GA. 304 STAINLESS STEEL ROUND CORNERED POLISHED
ULTRASONIC TANK LxWxH	21 1/2" x 15 3/4" x 12" DEEP
ULTRASONIC TANK CAPACITY	17.5 GALLONS
MINIMUM SOLUTION DEPTH	6 INCHES
TANK DRAIN	1" NPT
ULTRASONIC POWER	900 WATTS
OPERATING FREQUENCY	40 KHz
ELECTRICAL INPUT:	120 V, 50/60Hz, 1 PH, 9AMP
OR:	230 V, 50/60Hz, 1 PH, 4.5AMP
OVERLOAD PROTECTION	FUSED
CASTERS	FOUR (4) LOCKABLE 5" DIAMETER HEIGHT ADJUSTABLE CONDUCTIVE RUBBER
LINE CORD	SIX (6) FEET LONG
CONTROLS	TIMER 0-60 MINUTES WITH INDICATOR LAMP

ACCESSORIES (INCLUDED)

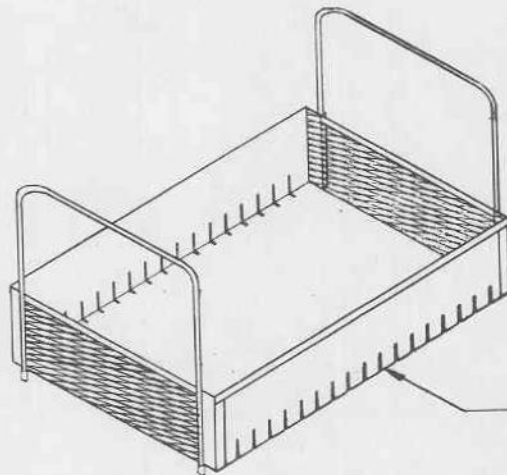
COVER STAINLESS STEEL LIFT-OFF TYPE
 BASKET STAINLESS STEEL WITH TWO (2) HANDLES (18 1/2x13 1/2x4 DEEP)
 DRAIN VALVE
 FILL HOSE FIVE(5) FEET LONG



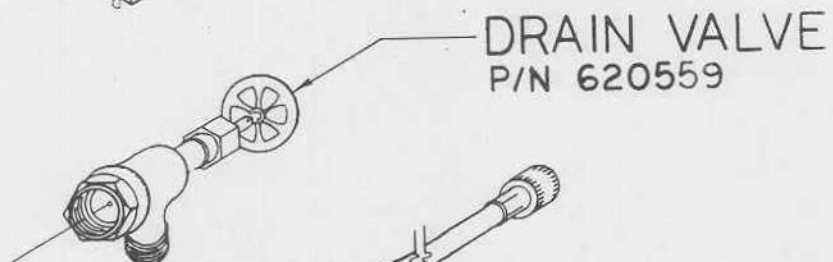
MOBILE ULTRASONIC CLEANER
 MODEL MSC-900T-11/21
 FIGURE 1



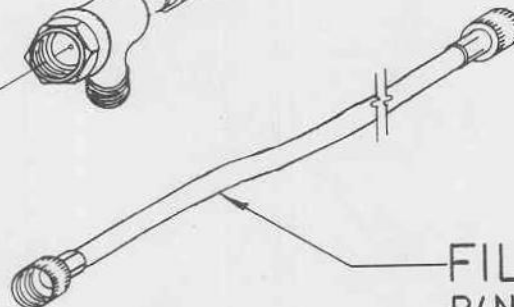
COVER
P/N F320436



BASKET
P/N F320437



DRAIN VALVE
P/N 620559



FILL HOSE
P/N 670307

ACCESSORIES FOR ULTRASONIC CLEANER
MODEL MSC-900T
FIGURE 2

SECTION II INSTALLATION AND STORAGE

2.1 UNPACKING AND HANDLING

Normal precautions in unpacking and reasonable care in handling, should be employed to avoid possible damage to the system. A visual inspection of all internal and external components and surfaces should be conducted to detect any damage which may have occurred during shipment. Retain container and packing material for subsequent reshipping and/or storage.

2.2 PLACEMENT OF EQUIPMENT

The unit should be placed where the rear of unit is at least six (6) inches from the wall or any obstruction. An undisturbed air flow from the rear to the front should always be maintained in order to keep the components at a safe operating temperature. Periodically check the air intake louvers to insure that dust, dirt or paper is not restricting the air flow. Clean as needed. The unit should be located near a sink for easy filling and disposal of contaminated solution.

2.3 PLUMBING REQUIREMENTS

Install a 1" NPT valve for drainage of tank solution. Locate unit near a source of warm water. The Fill Hose can be utilized for filling from a 3/4" hose fitting faucet.

2.4 ELECTRICAL REQUIREMENT (FIGURE 4 PAGE 17)

It is recommended that the unit be connected to a fused disconnect power box (circuit breaker), capable of accommodating the electrical requirement of the unit. The electrical requirement is stated on the serial and identification plate. The serial plate states the model number, serial number, voltage, phase, cycle and amperage. It is located next to the line cord, on the rear of the unit. The identification plate which is located on the front includes the model number, serial number, date, voltage, phase, hertz, NSN and FSCM

The MSC-900T-11/21 is equipped to accommodate either 115 volt or 230 volt, 50/60Hz single phase electrical input. For the desired voltage make simple quick disconnect connections described below and indicated on the wiring schematic (Figure 4 page 17) making sure to install the appropriate fuse and plug on line cord, if other than 115V input.

115 Volt, 50/60Hz, 1PH, Electrical Input

Connect red lead (push on lug) to terminal block position #4.
Connect gray lead (push on lug) to terminal block position #1.
Requires P/N 820512 12 Amp Fuse. Unit equipped with 115V plug.

230 Volt, 50/60Hz, 1PH, Electrical Input

Connect red lead (push on lug) to terminal block position #2.
Connect gray lead (push on lug) to terminal block position #3.
Requires P/N 820506 6 Amp Fuse. Install appropriate plug.

2.5 INDOOR STORAGE

1. Unplug the line cord, roll it into a small circle and secure it.
2. Drain the chamber.
3. Clean out residue inside tank, drain pipe and valve and wipe tank interior with soft cloth.
4. Wipe the outside of the console, of any solution that may have spilled, using soft cloth.
5. Remove console rear access panel.
6. Clean the interior of the generator housing and module(s) with the aid of a vacuum and/or a soft brush if required.
7. Replace console rear panel.
8. Protect the outer cabinet surface with a waterproofing stainless steel polish.
9. Protect the console with a plastic cover.
10. Before moving (rolling) release caster brakes.
11. Storage facilities environmental limitation temperature 0-125 Deg. F. humidity: 70 percent relative humidity for one year.

2.6 OUTDOOR STORAGE

1. Unplug the line cord, roll it into a small circle and secure it.
2. Drain the chamber.
3. Clean out residue inside tank, drain pipe and valve and wipe tank interior with soft cloth.
4. Wipe the outside of the console, of any solution that may have spilled using soft cloth.
5. Remove console rear access panel.
6. Clean the interior of the generator housing and module(s) with the aid of a vacuum and/or a soft brush if required.
7. Replace console rear panel.
8. Protect the outer cabinet surface with a waterproofing stainless steel polish.
9. Environmentally seal the console, including the casters.
10. Environment limitation humidity: 70 percent relative humidity, temperature 0-125 Deg F. for six months.

2.7 STORAGE FACILITY (INDOOR)

Storage should be protected from the elements such as water, dampness, and insects.(refer to 2.5).

2.8 INSPECTION/MAINTENANCE INSTRUCTION WHILE UNIT IN STORAGE (INDOOR)

1. Remove plastic covering.
2. Remove console rear panel.
3. Check for corrosion due to moisture. Remove corrosion and protect affected areas.
4. Remove and inspect each power module.
5. Clean and protect cabinet surface with waterproofing stainless steel polish.
6. Replace rear panel.
7. Replace plastic cover.

SECTION III OPERATION

3.1 DESCRIPTION OF OPERATING CONTROL

3.1.1 TIMER DIAL:(FIGURE 1 PAGE 4)

The Timer Dial energizes the ultrasonic generator and provides for 0-60 minute timed ultrasonic cleaning. To operate turn dial clockwise past 5 then set time.

3.1.2 TIMER INDICATOR LAMP: (FIGURE 1 PAGE 4)

The lamp will illuminate when timer is energized.

3.2 ULTRASONIC CLEANING PRINCIPLE

Ultrasonic cleaning is the rapid and complete removal of contaminants from objects by immersing them in a tank of liquid flooded with ultra high frequency sound waves. These non audible sound waves cause the liquid to act as its own scrub brush. High frequency electrical energy is produced by an ultrasonic generator. Transducers intimately bonded to tank bottom, converts electrical energy into high frequency sound energy. The ultrasonic energy enters the liquid in the tank and causes the rapid formation and collapse of minute bubbles, a phenomenon known as cavitation. The bubbles, traveling at high speed, implode on the parts immersed in the liquid solution, thus cleaning both the surfaces and inner most recesses of any intricately shaped parts.

3.3 ULTRASONIC CLEANING DATA

Ultrasonic cleaning was developed to provide a modern, safe and effective method of cleaning all types of parts. The cleaning of parts requires that penetration occurs on the surface and into the inner most areas of intricately shaped parts and subassemblies.

To accomplish proper cleaning, attention to key factors is important:

1. TIME
2. TEMPERATURE
3. CHEMISTRY
4. CONCENTRATION

Each of these factors should be researched to formulate the best cleaning method for any particular application.

1. Time -- Cleaning time will depend on the amount, location, and type of soil to be removed. While most surface soils can be removed instantaneously, heavy soil imbedded in the cracks, crevices, pores, and parts that are layered will increase cleaning time. A properly designed basket or rack is extremely important in getting maximum ultrasonic efficiency and productivity. Never overload a basket because fewer parts are cleaned faster and better.

2. Temperature - Temperature of a liquid affects both cavitation quality and chemical cleaning reaction. Both can usually be improved by increasing operating temperature above room temperature. However there is an ideal temperature at which cavitation intensity is greatest. This optimum temperature varies in liquids according to their properties. Aqueous detergent solutions usually cavitate best within the range of 100 to 160 degrees F. At temperatures above 160 degrees F, cavitation may diminish.

3. Chemistry -- Match the chemistry to the contaminants and parts to be cleaned. Select the cleaning solution that will best remove the soils without affecting the items being cleaned and has good cavitation properties. Never use a chemical that attacks the part, tank materials or inhibits ultrasonic cavitation.

4. Concentrations -- Chemical concentration is a definite factor in the cleaning process. Use the recommended concentrations listed on the container. Higher concentration can cause damage to parts and equipment. In some instances high concentration of chemicals will inhibit ultrasonic activity. Only recommended concentrations listed on the container should be used.

3.4 OPERATING INSTRUCTIONS

3.4.1 PRECAUTION / LIMITATION

1. Do not use chemical solution that would attack type 304 SS
2. Do not use volatile toxic or flammable solvents.
3. Do not place fingers in tank while the ultrasonics are ON.
4. Never operate the tank without six inches of solution depth.
5. Always experiment on a sample, when cleaning a new part.
6. Rinse parts after cleaning for best result.
7. Size limitation of work should not exceed 30 percent of the displaced working volume of liquid in the cleaning chamber.
8. The weight limitation of the tank should not exceed 80 pounds and must be able to fit into the basket.

3.4.2 EQUIPMENT SET-UP AND START-UP PROCEDURE

1. Check the electrical installation requirement, 115V or 230V.
2. Turn Timer knob to "0"
3. Close drain valve. (Installation ref. section 2.3 page 6)
4. Place unit where it is to be used (Refer. section 2.2 page 6) locking at least two caster brakes.
5. Fill chamber with fourteen (14) gallons of warm water. Add two (2) quarts SONICOR No. 105 Surgical Instrument Cleaner Detergent. This will allow for a nominal two (2) inch free board. CAUTION: It is recommended that the unit be moved only when empty to avoid splashing and spillage.
6. Plug line cord into electrical source.
7. Turn the Ultrasonic Timer Knob to 15 minutes, (turn clockwise). The indicator lamp will illuminate as the Timer knob is turned.

- a. At this point, the solution will go through a process called Degassing, which is the releasing of entrapped air from the cleaning solution. This process should take between ten (10) to fifteen (15) minutes before full Ultrasonic efficiency is achieved. Degassing should be performed after fresh solution and whenever the solution has been stagnant over a long period of time.
 - b. There will be a buzzing and/or squealing sound coming from the Ultrasonic chamber signifying the presence of Ultrasonic energy in the chamber. The buzzing /squealing sound will vary throughout the operation as well as the ripples on the surface. These conditions have no bearing on the efficiency of the Cleaner, but serve as visual and audible indicators. When parts are in the chamber the buzzing sound is reduced. Violent movement of liquid will cause a squealing sound. Therefore, always lower and remove basket slowly.
8. Check the Generator section to insure that the LED indicator lamp on each power module is glowing. This indicates proper functioning and is observed by removal of cabinet rear panel.
 9. At end of timer cycle, the ultrasonics will automatically turn OFF. Unit is now ready for operation.
 10. It is a good policy to remove the AC connection whenever unit is not being used.

3.4.3 CLEANING DATA

Once installation and set-up/start-up procedure is completed, the unit is ready to process parts.

CAUTION: NEVER OPERATE UNIT WITHOUT LIQUID.

3.4.3.1 FACTORS THAT DETERMINE THE LEVEL OF SOLUTION

- a. Minimum solution depth of six (6) inches.
- b. Add additional liquid (if necessary) so that the solution level is at least 1 1/2" above the height of the parts.
- c. Normal operation will be to fill tank with warm water to 2 1/2" from top and add two (2) quarts of SONICOR No. 105 Detergent for cleaning of surgical instruments.
- d. Always degas fresh solution for a minimum of ten (10) minutes before cleaning parts.

3.4.3.2 BASKET LOADING INFORMATION

- a. Open all jointed articles for maximum exposure of joint, jaw, blade, and lock surfaces.
- b. Place items in basket one at a time, positioned and stacked for maximum surface exposure. Use a crisscrossed layer pattern with each layer in opposite direction to avoid closely packed or dense areas. Place the longer and heavier items on the bottom. For maximum cleaning performance, use additional basket loads rather than overloading a single basket. Fewer parts are cleaned faster and better.

3.4.4 CLEANING PROCEDURE

1. Rinse the part(s) thoroughly with warm water prior to immersing them in the ultrasonic chamber. Rinsing off loose contaminants keeps the Ultrasonic Cleaning Chamber and the cleaning solution cleaner and fresher. This will improve the cleaning process and extend the life of the cleaning agent.
2. Carefully place the part(s) (refer to 3.4.3.2) in the basket and lower slowly into the Ultrasonic chamber. Try not to scratch the side walls or bottom and NEVER drop anything on tank bottom.
3. Rotate the timer knob to set the desired time cycle.
4. Allow the part(s) to be permeated with the Ultrasonic energy for required time cycle. A sample cleaning of parts will enable determination of the best cleaning time.
5. At end of Time cycle the ultrasonics will go OFF.
6. Carefully and slowly remove the basket of the cleaned parts from the Ultrasonic Chamber. Try not to scratch the side walls.
7. Rinse the cleaned parts thoroughly with warm to hot water.
8. Repeat procedure for next batch.

3.4.5 SHUT DOWN PROCEDURE

1. If the solution is to be reused, place the cover on the console.
2. If solution is to be disposed of, open the drain valve and dispose of spent cleaning solution. CAUTION Never open the drain valve unless the Timer is at "0" and ultrasonic generator is OFF.
3. Rinse the residue from the Cleaning Chamber.
4. Wipe down the inside and outside surface with a soft damp cloth.
5. Place lift-off cover on unit
6. For storage refer to section 2.5 or 2.6 page 7.

SECTION IV
OPERATIONAL MAINTENANCE

4.1 SERVICE AND TROUBLESHOOTING

Unless the operational specialist is familiar with the system's electrical and operational characteristics, it is recommended that assistance be obtained.

4.2 PERIODIC INSPECTION

4.2.1 PREVENTIVE MAINTENANCE EXTERIOR(OPERATOR)

Wipe the outside of the system and clean up any solution that has spilled. Every week, or as often as necessary clean out residue inside drain pipe and valve. Inspect line cord. It should be free from cracks, cuts and extreme brittleness. Check fuse holder to insure that its secure.

4.2.2 PREVENTIVE MAINTENANCE INTERIOR(TECHNICIAN)

In order to minimize any down time of the Ultrasonic Cleaning Console, a periodic interior maintenance/inspection should be conducted. Disconnect power to the Console. Remove cabinet rear access panel. Due to the constant flow of air through the generator section, dirt may accumulate upon the components. With the aid of a vacuum or soft brush, clean the interior of the generator module housing and modules. Care should be exercised not to damage or disengage any components. Visually inspect all wires and check connections for good continuity. Replace Cleaner rear access panel. The Console is ready for operation.

4.3 BASIC TROUBLESHOOTING(TECHNICIAN)

To aid personnel in identifying various components and locating connection points Figure 3 page 15 with Table 1 page 16 and Figure 4 page 17 are provided for assistance.

Always be sure that power is disconnected to system during inspection and/or removal of components unless it is necessary to observe the Power Module LED indicator or check of a component failure.

4.3.1 NO ACTIVITY IN THE ULTRASONIC TANK (TECHNICIAN)

- a. Check that there is power to the unit.
- b. Check cabinet fuse (rear of unit)
- c. Remove rear panel and with the line cord connected, turn the unit ON. Check that the LED indicators on each Power Module is glowing. If indicators are not glowing, the Power Module(s) should be replaced, but not before checking step "e" and reference malfunction analysis chart.
- d. Turn the unit OFF. disconnect line cord.
- e. Check that all wires are properly connected from Transducers to Power Modules, fan motors, terminal block, fuse post, EMI assembly, timer and timer indicator. Inspect for solution leakage and arcing of transducers and internal components.

4.3.2 POWER MODULE REPLACEMENT INSTRUCTIONS (TECHNICIAN)

- a. If after comprehensive inspection, it is concluded that Power Module(s) is defective, the following procedure is necessary for the removal and reinstallation of power module(s).
- b. With the rear panel removed and line cord plug disconnected, unplug the two (2) RF output leads on the module(s). One is green and the other can be either red, yellow and/or white.
- c. Remove module by pulling toward rear of cabinet. The module is on slides and plugs into the housing socket.
- d. To install a power module reverse removal procedure, visually inspect all connections.
- e. With rear panel off make sure there is a minimum of six (6) inches of water and detergent in the tank, plug in line cord, turn time switch to 15 minutes and observe that the module LED's are glowing and there is activity in the tank.
- f. If preceding step "e" satisfactory, turn off timer, unplug line cord and replace cabinet rear panel. Unit ready for use.
- g. If preceding step "e" unsatisfactory, shut off timer, unplug line cord, replace rear panel notify maintenance specialist

4.3.3 MALFUNCTION ANALYSIS CHART(TECHNICIAN)

The chart is a detailed symptom aid in diagnosing and locating a defective component or assembly. Notify maintenance specialist.

SYMPTOM	PROBABLE CAUSE
MAIN POWER FUSE FAILED.	1. UNDER RATED FUSE 2. INCORRECT VOLTAGE
INDICATOR LAMP FAILS TO ILLUMINATE WHEN TIMER IS ENERGIZED.	1. UNPLUGGED UNIT 2. DEFECTIVE LINE CORD 3. DEFECTIVE TIMER 4. DEFECTIVE FUSE 5. DEFECTIVE INDICATOR
FAN(S) DO NOT OPERATE WHEN TIMER IS ENERGIZED LIGHT ILLUMINATES.	1. LOOSE OR BROKEN WIRE TO FAN 2. DEFECTIVE FAN MOTOR
FUSE FAILS WHEN TIMER IS ENERGIZED.	1. UNDERRATED FUSE 2. INCORRECT VOLTAGE 3. DEFECTIVE TRANSFORMER 4. SHORT IN WIRING
LOW ACTIVITY IN TANK. TIMER ENERGIZED INDICATOR ILLUMINATES AND FAN(S) OPERATE.	1. SOLUTION HAS NOT BEEN DEGASSED 2. SOLUTION DOES NOT CONTAIN WETTING AGENT (CLEANING CHEMICAL) 3. SOLUTION IS EXCESSIVELY CONTAMINATED 4. SOLUTION HAS NOT REACHED OPERATING TEMPERATURE 5. LOW INPUT VOLTAGE 6. MODULE(S) HAS FAILED

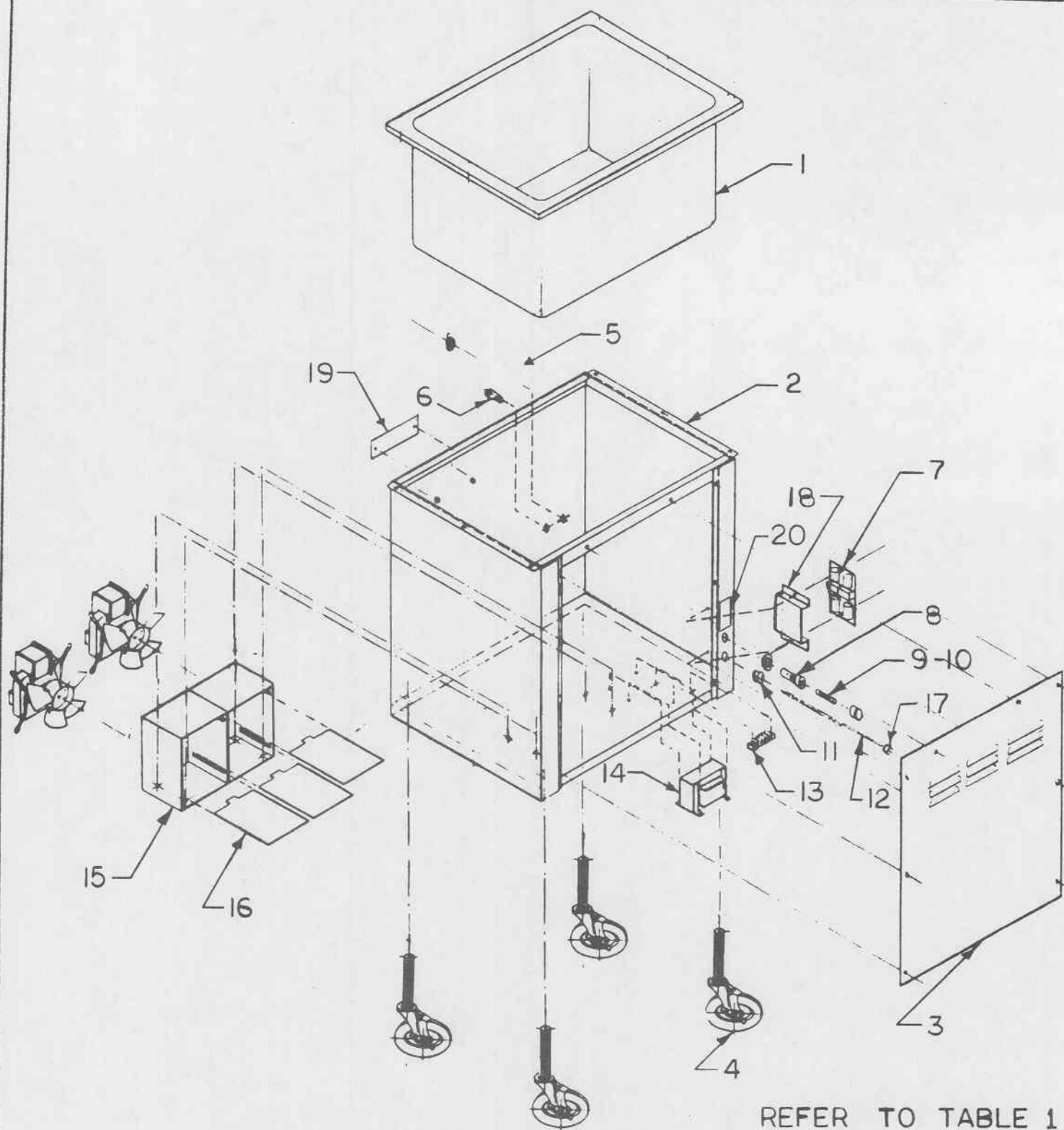
NO ACTIVITY IN TANK.
TIMER ENERGIZED INDICATOR
ILLUMINATES. FAN(S) OPERATE.

1. SHORT IN RF WIRING
2. CHECK POWER MODULE(S)

4.4 RETURN OF EQUIPMENT

The system has been designed for reliable, trouble free performance. After prolonged use, should a field unrepairable malfunction occur, return the system or assembly to the factory. But first contact SONICOR service department and proceed with the following steps to insure prompt attention and service:

1. Specify date of purchase, model and serial number.
2. Provide efficient packing to insure against damage during shipment.
3. Send equipment prepaid and indicate method of return shipment.



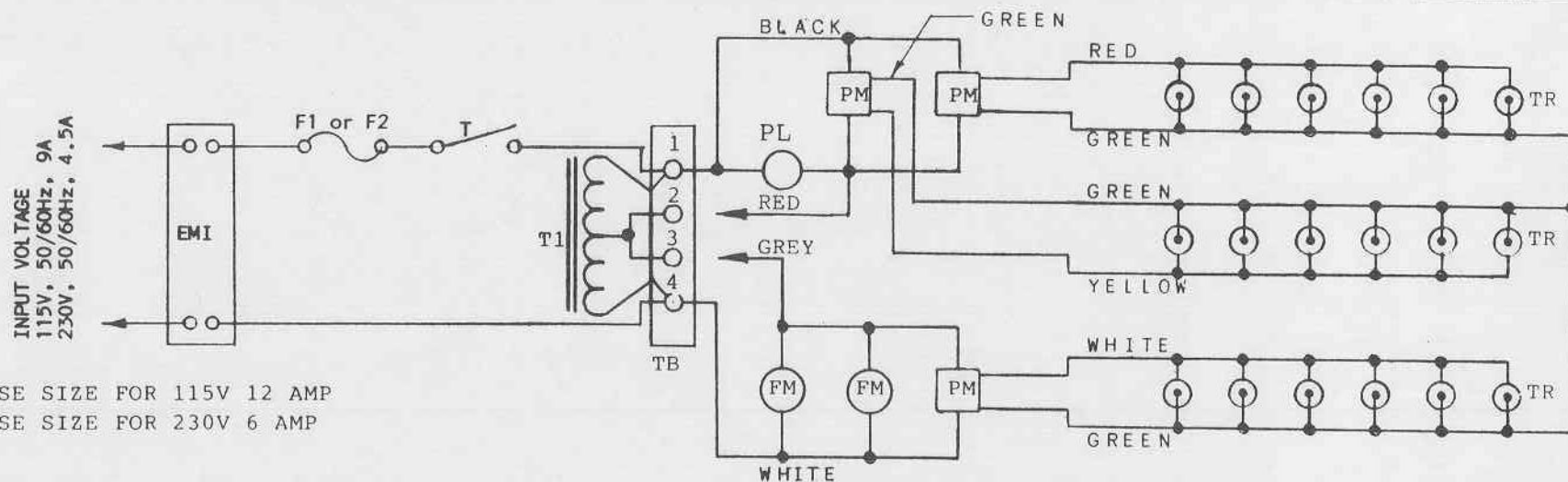
REFER TO TABLE 1

CLEANER ASSEMBLY
MODEL MSC-900T-II/2I
FIGURE 3

FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNIT PER ASSY
3-17	---	ULTRASONIC CLEANER MSC-900T-11/21	REF
-1	S360521	TANK ASSEMBLY	1
-2	F302271	CABINET	1
-3	F302262	REAR PANEL	1
-4	870244	CASTER/ASSEMBLY	4
-5	S821020	TIMER (0-60 MINUTES) ASSEMBLY	1
-6	800101	PILOT LAMP	1
-7	S430074	EMI SUPPRESSOR	1
-8	820553	FUSE HOLDER ASSEMBLY	1
-9	820512	FUSE (12 AMP 115 VOLTS)	1
-10	820506	FUSE (6 AMP 230 VOLTS)	1
-11	850162	STRAIN RELIEF LINE CORD	1
-12	830013	LINE CORD	1
-13	841514	TERMINAL BLOCK	1
-14	410104	TRANSFORMER	1
-15	S250061	MODULE HOUSING ASSEMBLY	2
-16	S420479	POWER MODULE	3
-17	680001	PLUG, 115 VOLT	1
-18	T300624	EMI SUPPRESSOR BOX	1
-19	F880091	IDENTIFICATION PLATE	1
-20	880011	SERIAL PLATE	1

REFERENCE FIGURE 3
 ULTRASONIC CLEANER ASSEMBLY PARTS LIST
 MODEL MSC-900T-11/21

TABLE I



F1 FUSE SIZE FOR 115V 12 AMP
F2 FUSE SIZE FOR 230V 6 AMP

FIGURE & SYMBOL	PART NUMBER	DESCRIPTION	UNITS PER ASSY
4-	--	ULTRASONIC CLEANER SCHEMATIC	REF
-PM	S420475	POWER MODULE	3
-FM	890007	FAN MOTOR ASSY	2
-PL	800101	PILOT LIGHT	1
-T	S821012	TIMER	1
-EMI	S430074	EMI SUPPRESSOR	1
-F1	820512	FUSE 12 AMP	1
-F2	820506	FUSE 6 AMP	1
-T1	410104	TRANSFORMER	1
-TB	841514	TERMINAL BLOCK	1
-TR	S590151	TRANSDUCER	18

INPUT TERMINAL CONNECTION
FOR: 115V CONNECT RED TO No.4
GRAY TO No.1
FUSE F1

FOR: 230V CONNECT RED TO No.2
GRAY TO No.3
FUSE F2

INSTALL APPROPRIATE PLUG
ON LINE CORD

ULTRASONIC CLEANER SCHEMATIC
MODEL MSC-900T-11/21
FIGURE 4

SECTION V
COMPONENT REPLACEMENT

5.0 COMPONENT REPLACEMENT INSTRUCTIONS

Refer to Figure 3 page 15 and Table 1 page 16 for location of components and subassemblies.

5.1 POWER MODULE REPLACEMENT

Refer to Figure 14 page 35 (section VI)

5.1.1 REMOVAL

1. Disconnect the line cord plug.
2. Remove rear access panel.
3. Unplug on the module the RF output leads to the transducers. One wire is green and the other can be either red, yellow and white. (RF high, RF low)
4. Remove module by pulling toward rear of the cabinet. The module is on slides and plugs into the housing socket.

5.1.2 INSTALLATION

1. Carefully insert module in slides checking orientation of module for proper positioning.
2. Slide module into housing and insure positive connection into socket of module housing.
3. Connect the RF transducer leads to the module. One will be green (RF low) the other can either be red, yellow and/or white. Green connection will always be toward edge of board.
4. Visually inspect all connections.
5. Plug in line cord and check that the operational LED is glowing and unit is operational.
6. Unplug line cord.
7. Replace cabinet rear panel.

5.2 TIMER REPLACEMENT

Refer to Figure 3 page 15.

Figure 5 page 22.

5.2.1 REMOVAL

1. Unplug the line cord.
2. Remove rear access panel.
3. Locate Timer and check alignment.
4. Unplug two quick disconnect lugs from the rear of the Timer. One red lug with single black wire lower connection. One blue lug with two black wires upper connection.
5. Remove Timer knob, (pry outwards).
6. Unscrew Assembly.
7. Remove Timer dial.
8. Remove Timer from the inside of the unit.

5.2.2. INSTALLATION

1. Install Timer, from inside cabinet, align writing so that it is readable left to right.
2. Install and align Timer dial from cabinet exterior.
3. Install Timer nut.
4. Install Timer knob.
5. Replace wires refer to step 4 section 5.2.1.
6. Plug line cord into receptacle and test.
7. Install rear access panel

5.3 PILOT LAMP REPLACEMENT

Refer to Figure 6 page 23.

Figure 13 page 30.

6.3.1 REMOVAL

1. Unplug the line cord.
2. Remove rear access panel.
3. Locate pilot lamp.
4. Unplug two quick disconnect lugs (red and black wire)
5. Remove pilot lamp. Depress all four stops and push lamp forward.

5.3.2 INSTALLATION

1. Insert new pilot lamp from cabinet front.
2. Connect the two quick disconnect lugs.
3. Insert line cord plug into receptacle and test.
4. Install rear access panel.

5.4 FUSE REPLACEMENT

Refer to Figure 6 page 23.

5.4.1 REMOVAL

1. Depress fuse holder cap and turn counter clockwise.
2. Withdraw fuse holder cap with fuse.
3. Separate cap from fuse.

5.4.2. INSTALLATION

1. Insert new fuse into holder cap (same amperage).
2. Insert fuse with cap into holder.
3. Orient the tabs on the cap with the holder.
4. Depress cap fully and turn clock-wise.

5.5 TRANSFORMER REPLACEMENT

REFER TO FIGURE 7 PAGE 24.

5.5.1 REMOVAL

1. Unplug line cord.
2. Remove rear access panel.
3. LOcate transformer.
4. Make diagram of wiring from the transformer to the terminal strip.
5. Remove the transformer wires from the terminal strip noting locations.
6. Remove the nuts (4) that hold the transformer in place.
7. Lift transformer off studs.

5.5.2 INSTALLATION

1. locate new transformer in position.
2. Secure transformer (4 places).
3. According to diagram connect transformer wires to the terminal strip.
4. Install rear access panel.
5. Insert line cord plug into its receptacle.

5.6 FAN MOTOR ASSEMBLY REPLACEMENT

Refer to Figure 8 page 25.

5.6.1 REMOVAL

1. Unplug line cord.
2. Remove rear access panel.
3. Locate defective fan assembly.
4. Remove power modules from housings.
5. Remove the nut at the bottom of each housing.
6. Remove (cut) wire ties from the RF wires from transducers freeing the housing.
7. Orient the housing for easy access to the fan assembly.
8. Remove fan assembly from housing.
9. Cut the wires (2) from the defective fan assembly in an appropriate location to rewire new fan.

5.6.2 INSTALLATION

1. Connect the wires (2) to the new fan assembly.
2. Assemble fan assembly, in the same fashion in which it was removed, from the housing.
3. Reinstall and secure housing in position.
4. Wire tie RF transducer wires to the top of the housing.
5. Install power modules .
6. Inspect all work done.
7. Insert line cord plug into receptacle and test.
8. Install rear access panel.

5.7 EMI ASSEMBLY REPLACEMENT

Refer to Figure 9 page 26.

5.7.1 REMOVAL

1. Unplug line cord.
2. Remove rear access panel.
3. Locate EMI suppressor.
4. Remove EMI suppressor cover.
5. Remove EMI suppressor from standoffs.
6. Make diagram of wire color, locations and PCB orientation.
7. Unsolder the wires.

5.7.2 INSTALLATION

1. Orient the PCB, locate the wires to their respective positions.
2. Solder the wires to the printed circuit board.
3. Re-check the wiring.
4. Mount the EMI suppressor board on the stand off.
5. Install the EMI suppressor cover.
6. Insert line cord plug into receptacle and test.
7. Install rear access panel.

5.8 ULTRASONIC TANK REPLACEMENT

Refer to Figure 10 page 27.

5.8.1 REMOVAL

1. Unplug line cord.
2. Remove rear panel.
3. Disconnect RF wires to modules.
4. Remove valve and nipple.
5. Remove four (4) ESNA nuts from under tank flange.
6. Lift tank from cabinet.

5.8.2 INSTALLATION

1. Drop tank into cabinet aligning studs on flange with holes of cabinet
2. Put four (4) ESNA nuts on studs.
3. Screw in nipple with teflon tape on threads being careful not to over tighten and affect the elbow weld.
4. Replace valve on nipple with teflon tape.
5. Secure the RF wires from the transducers to the modules.
6. Connect the RF wires from the transducers to the modules.
7. Check all internal wiring.
8. Load tank with water and detergent.
9. Plug line cord into receptacle.
10. Check that all module LED's are glowing and activity in tank.
11. Unplug line cord.
12. Replace cabinet rear panel.

5.9 CASTER ASSEMBLY REPLACEMENT

Refer to Figure 11 page 28.

5.9.1 REMOVAL

1. Place unit carefully upside down.
2. Grip section above caster and turn counter-clockwise and unscrew assembly.

5.9.2 INSTALLATION

1. With the unit upside down screw assembly clockwise into base of cabinet.

5.10 DRAIN VALVE REPLACEMENT

Refer to Figure 12 page 29

5.10.1 REMOVAL

1. Drain the chamber.
2. Remove valve using two (2) wrenches, one as a backup on the nipple and one on the valve.
3. Disassemble valve -replace worn washer(s).

5.10.2 INSTALLATION

1. Assemble the valve using (2) wrenches, one as a backup on the nipple and one on the valve.

5.11 WIRE HARNESS REPLACEMENT

Refer to Figure 13 page 30.

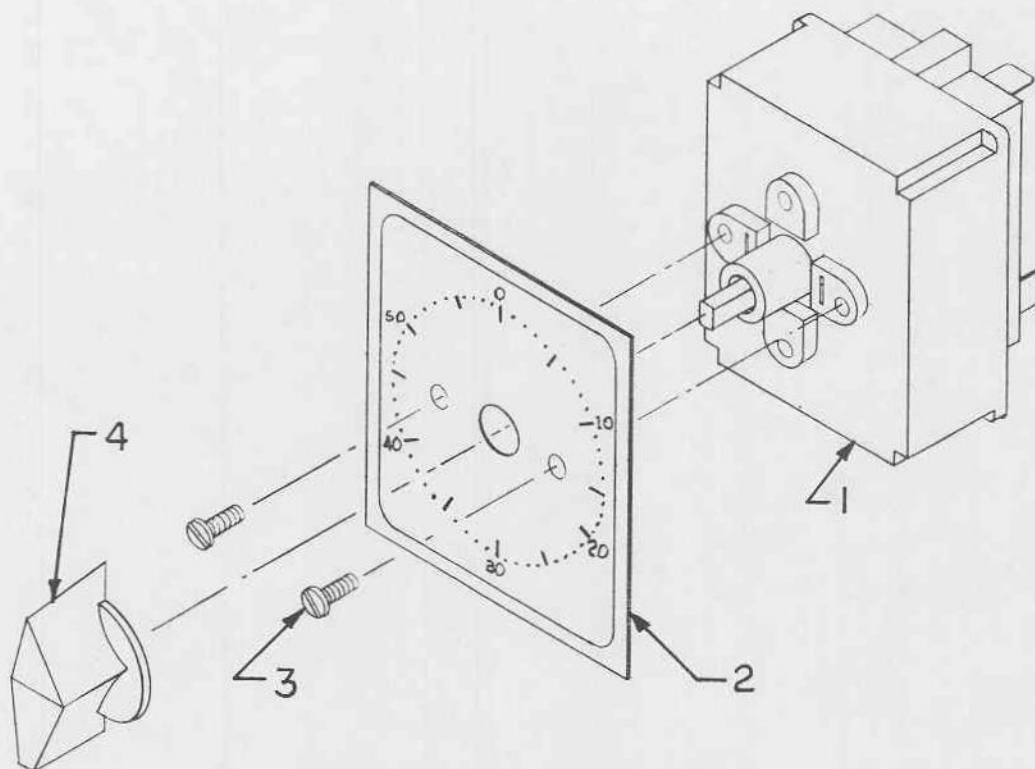


FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNIT PER ASSY
5-	S821020	TIMER ASSEMBLY	1
-1	821020	TIMER 0-60 MINUTES	1
-2	880104	LABEL 60 MINUTES	1
-3	820152	SCREWS	2
-4	820156	KNOB, TIMER	1

TIMER ASSY P/N S821020
MODEL MSC-900T
FIGURE 5

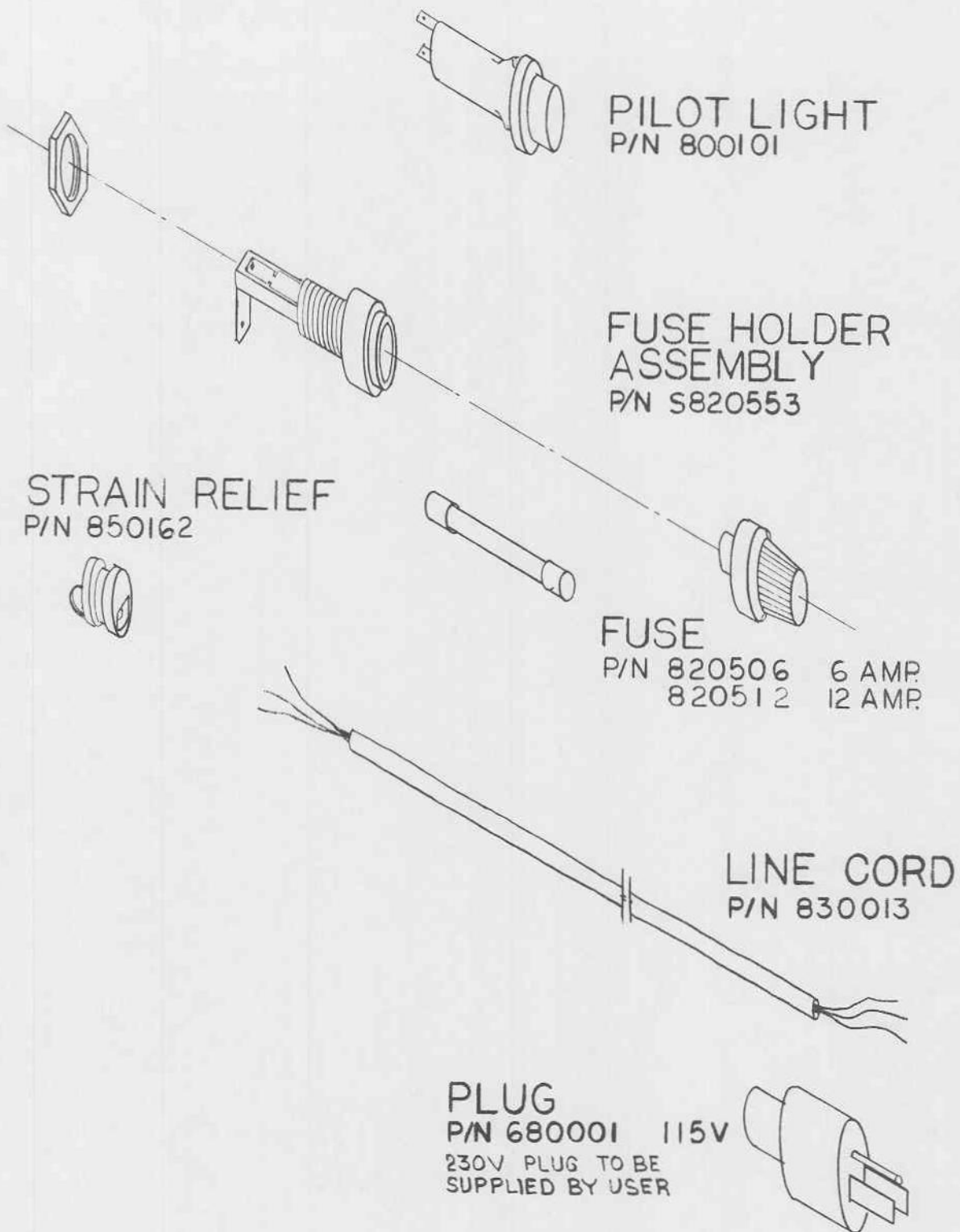


FIGURE 6

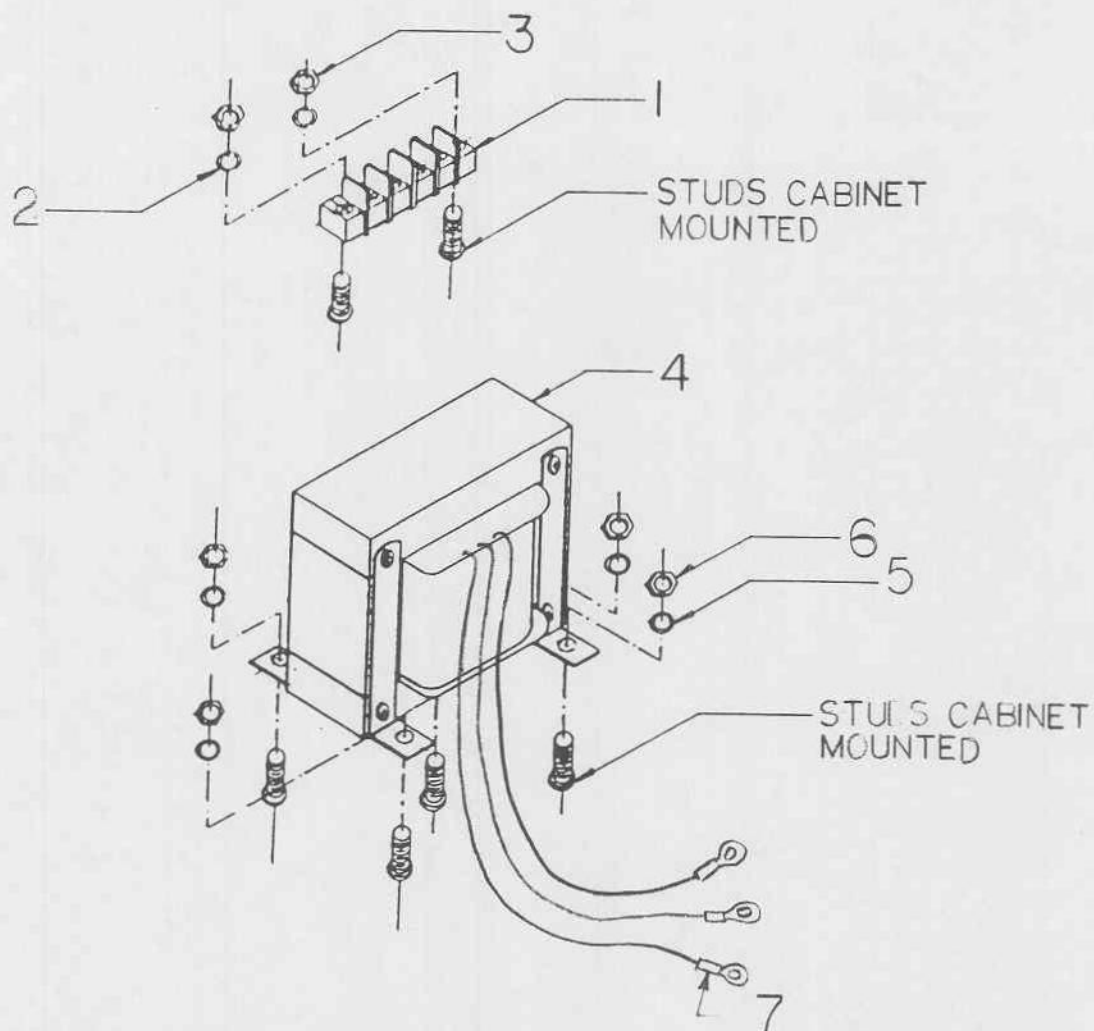


FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNITS PER ASSEMBLY
7-	---		---
-1	841514	TERMINAL BLOCK (4 POSITION)	1
-2	860027	WASHER, NO 6 INTERNAL TOOTH	2
-3	860022	NUT, 6-32 PLT. HEX SMALL PAT.	2
-4	410104	TRANSFORMER	1
-5	960227	WASHER, NO 6 INTERNAL TOOTH	4
-6	860221	NUT 6-32 PLT. HEX	4
-7	850016	RED NO. 6 RING LUG	3

TRANSFORMER ASS'Y AND TERMINAL BLOCK
MODEL MSC-900T-11/21
FIGURE 7

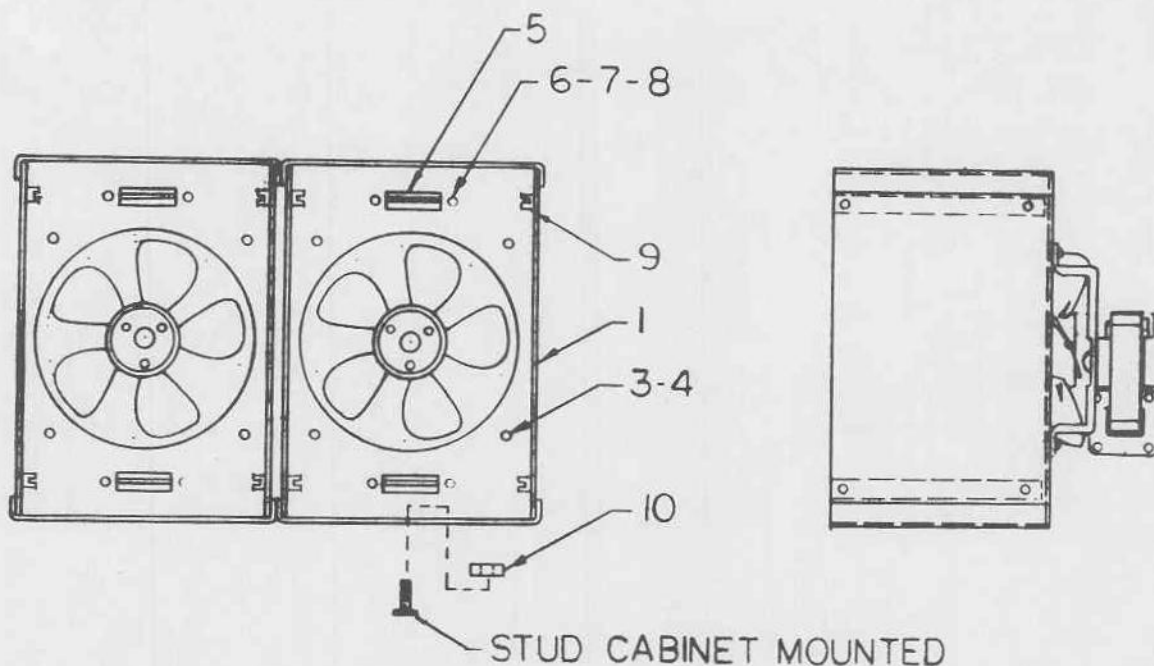
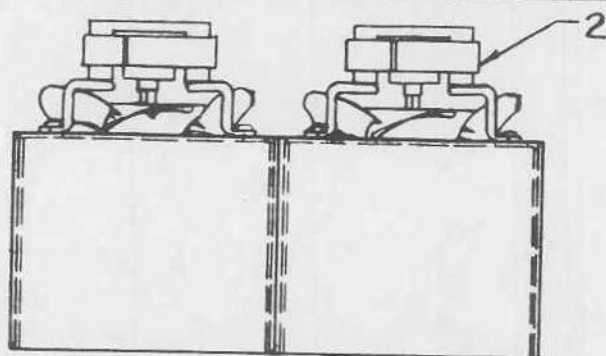


FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNITS PER ASSEMBLY
8-	S250061	MODULE HOUSING ASSEMBLY	2
-1	T300811	MODULE HOUSING	1
-2	890007	FAN MOTOR ASSEMBLY	1
-3	860002	SCREW 6-32 x 3/8 LG	4
-4	860035	NUT NO. 6 - 32 HEX ESNA	4
-5	840161	CINCH CONNECTOR	2
-6	860169	SCREW 4-40 x 5/8 LG	4
-7	860178	WASHER, NO. 4 EXTERNAL TOOTH	4
-8	860171	NUT 4-40 HEX	4
-9	850131	PCB GUIDE	4
-10	860378	NUT NO. 10 - 32 FLEXLOCK	1

MODULE HOUSING ASSEMBLY
MODEL MSC-900T
FIGURE 8

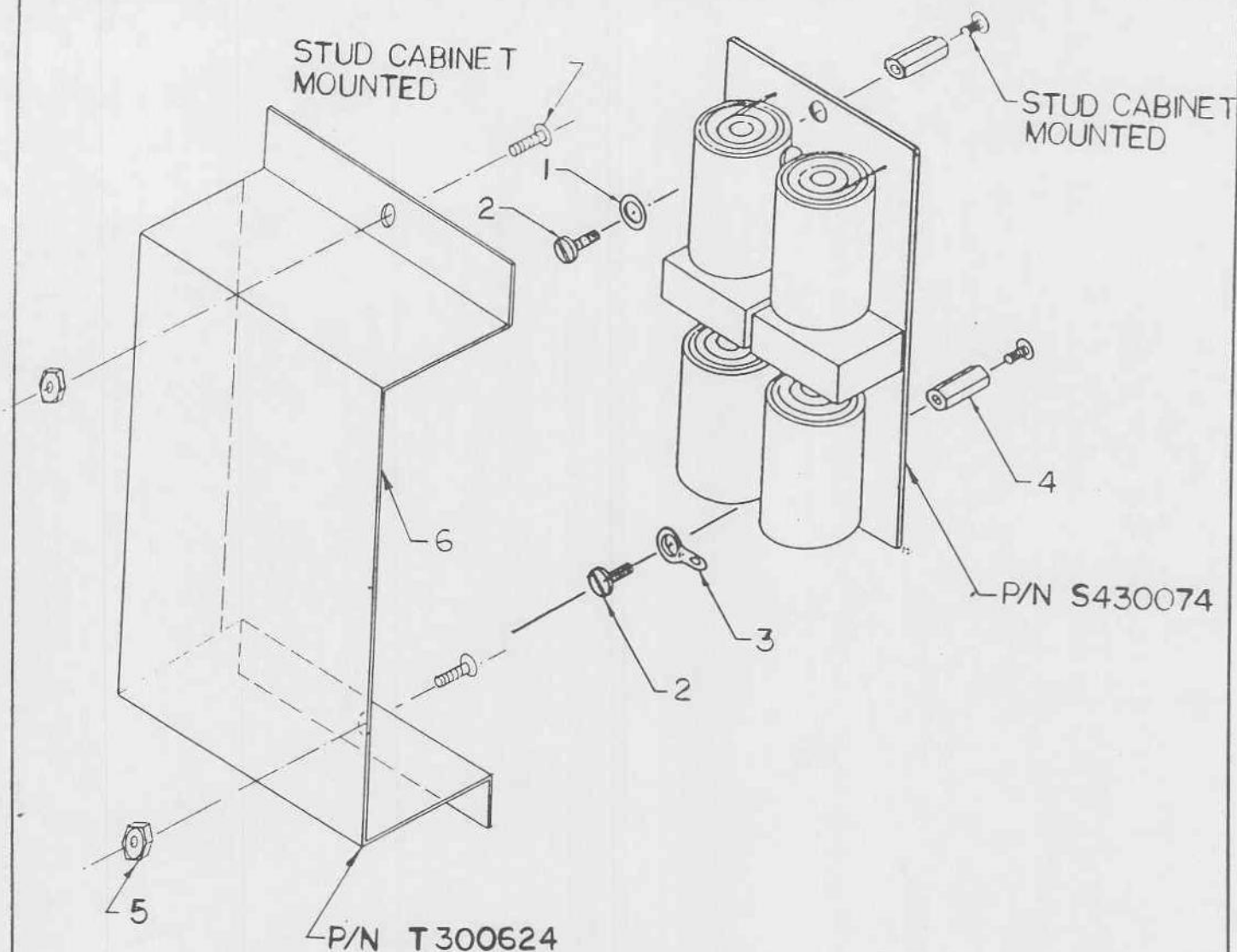
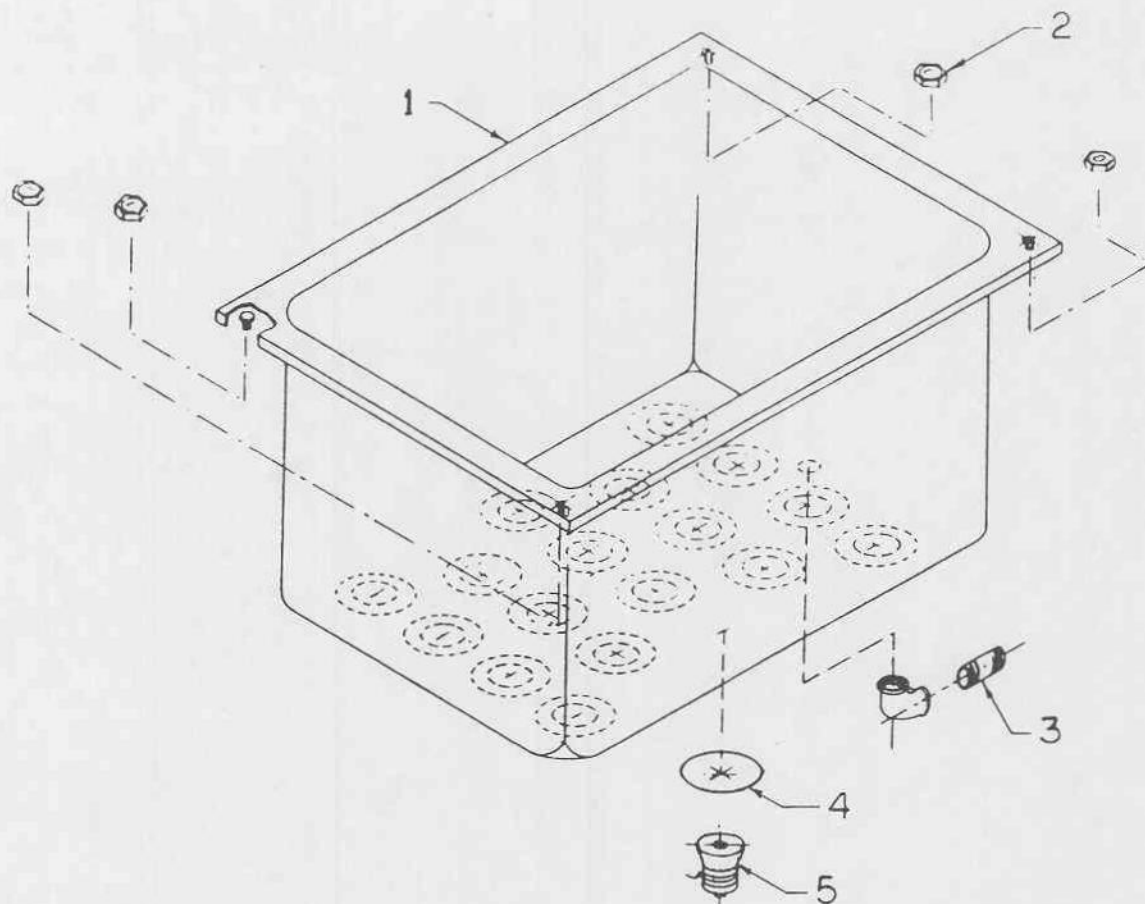


FIGURE & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSEMBLY
9 -	S430074	EMI SUPPRESSOR	REF
-1	860027	WASHER NO. 6 INTERNAL TOOTH	2
-2	860002	SCREW NO. 6 x 3/8" LONG	2
-3	850001	SOLDER LUG INTERNAL TOOTH	1
-4	850628	SPACER 6-32 x 5/8 HEX ALUM.	2
-5	860021	NUT NO. 6-32 HEX MS PLT	2
-6	T300624	EMI SUPPRESSOR BOX	1

EMI SUPPRESSOR ASS'Y AND COVER
MODEL MSC-900T
FIGURE 9



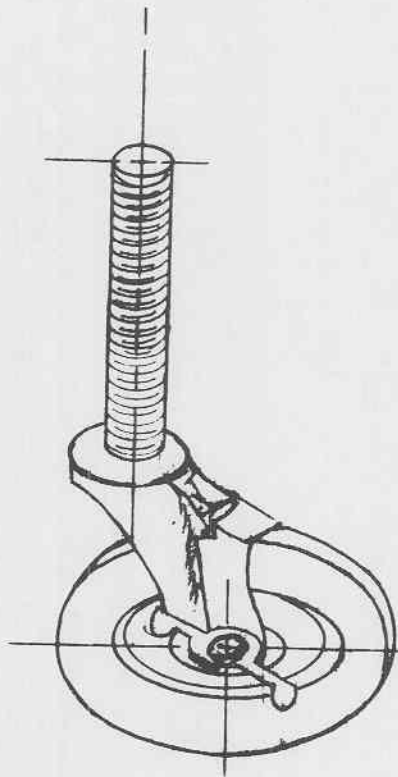
NOTE:

- 1) -4 EPOXIED TO TANK BOTTOM
-5 EPOXIED TO -4
- 2) TRANSDUCERS PARARELL WIRED IN
GROUPS OF SIX (6)

FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNITS PER ASSY
10-	S360521	ULTRASONIC TANK ASSEMBLY	REF
-1	F320144	TANK W/1" NPT ELBOW DRAIN FITTING	1
-2	860235	NUT, NO 8-32 ESNA	4
-3	610527	NIPPLE 1" x 2½" SS	1
-4	F590121	COUPLING DISC	18
-5	S590151	TRANSDUCER	18

ULTRASONIC CLEANER TANK ASS'Y
MODEL MSC-900T
FIGURE 10

P/N 870244



CASTER ASSEMBLY
MODEL MSC-900T
FIGURE II

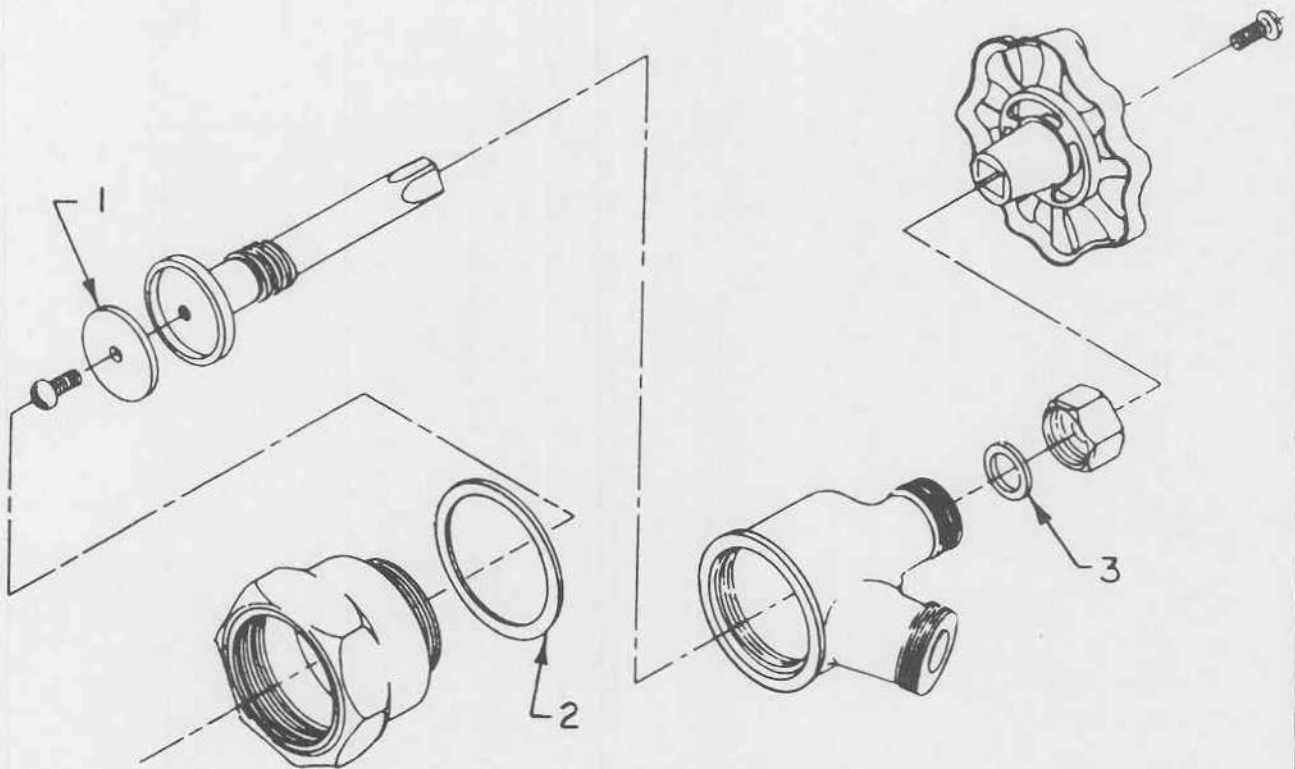
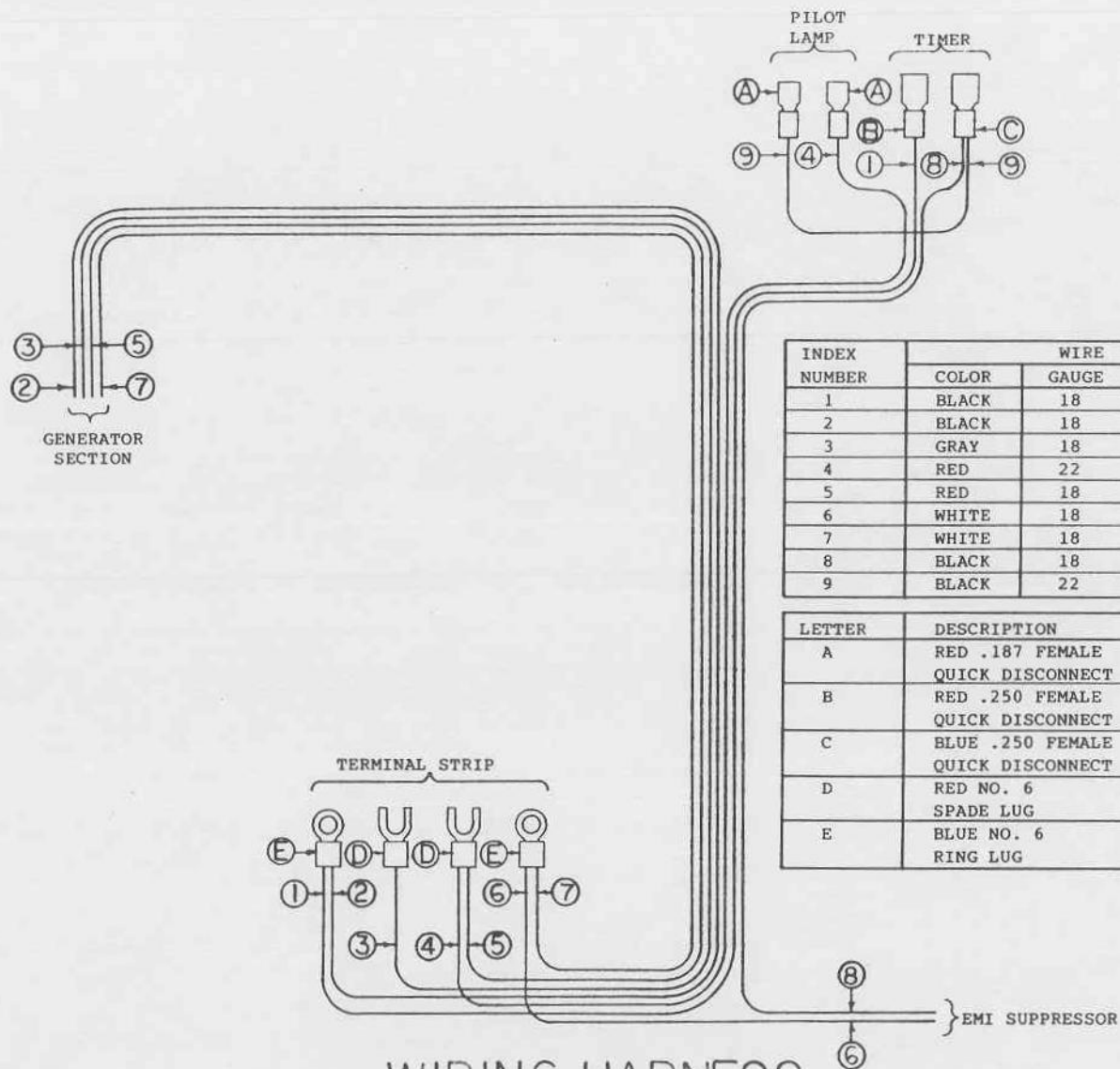


FIGURE & INDEX NO	PART NO	DESCRIPTION	UNITS PER ASSY
	S620560	WASHER KIT	1
-1	620560	WASHER, RUBBER VALVE SEAT	1
-2	620561	WASHER, FIBER HEAD SEAL	1
-3	620562	WASHER, FIBER NUT SEAL	1

DRAIN VALVE WASHER KIT
FOR DRAIN VALVE P/N 620559
FIGURE 12



INDEX NUMBER	WIRE		
	COLOR	GAUGE	LENGTH
1	BLACK	18	40"
2	BLACK	18	31"
3	GRAY	18	40"
4	RED	22	32"
5	RED	18	40"
6	WHITE	18	17"
7	WHITE	18	40"
8	BLACK	18	36"
9	BLACK	22	6"

LETTER	DESCRIPTION	PART NO
A	RED .187 FEMALE QUICK DISCONNECT	850013
B	RED .250 FEMALE QUICK DISCONNECT	850019
C	BLUE .250 FEMALE QUICK DISCONNECT	850024
D	RED NO. 6 SPADE LUG	850016
E	BLUE NO. 6 RING LUG	850020

WIRING HARNESS
MODEL MSC-900T-11/21
FIGURE 13

SECTION VI

POWER MODULE SERVICE AND REPAIR

6.1 DESCRIPTION OF POWER MODULE

The SONICOR Ultrasonic Power Module features the latest state-of-the-art solid state power circuitry technology. The automatic self tuning Do-o-Reflex full wave continuous power output circuitry maintains the maximum operating efficiency. The modular plug in PCB provides easy replacement by simple slide in and out construction. The operational board mounted LED indicator provides immediate notification of power module operation. To prepare maintenance personnel in understanding and trouble shooting the Power Module the following are supplied:

- a. Theory of Operation
- b. Schematic Diagram Figure 4 Page 17
- c. Displays 1 through 4 page 40-43
- d. Tables 2 and 3 page 37-38

6.2 THEORY OF OPERATION

6.2.1 THE POWER MODULE CONSISTS OF TWO SECTIONS

- a. Oscillator Section
- b. Power Supply Section

6.2.2 OSCILLATOR SECTION

The combination of output transformer T2, input transformer T1 and the switching transistors Q1 and Q2 constitute a Class D oscillator which generates the ultrasonic power to operate the tank transducers.

When power is applied at 4, the collector of Q1 is forward-biased through the starting network R1 C5 and Q1 draws current through PO1. Current flowing in PO1 induces A negative voltage across PO2 to turn Q2 off; it also induces current to flow through the output circuit and through PI2. The current in PI2 forward-biases Q1 keeping it turned on while it reverses - biased Q2 to keep it off.

The rising magnetic field around PO1 is meanwhile causing the voltage drop across the winding to increase until it equals the supply voltage. Current in the Q1, PO1 combination then drops to zero, as does the current through PI2. The loss of current in PI2 reverses the polarities of PS1 and PS2 to turn Q1 off and Q2 on.

The sustained oscillation resulting from the alternate operation of Q1 and Q2 occurs at a frequency determined by the inductances of SO1 and P1 and the capacitances of C1 and the tank transducers.

The series combination of C1 and PI1 provides voltage feedback to control the amplitude of the output voltage and the phase relationship between collector current and voltage waves.

A single turn of wire through the core of T2 supplies power to operate an LED to indicate correct operation of the module.

6.2.3 POWER SUPPLY SECTION

Bridge rectifier RB1 and filter capacitor C1 convert the AC line voltage to supply direct-current power to the oscillator section.

Fusible resistor R1 protects the printed circuit board and the bridge rectifier from short circuiting other board components.

6.2.4 POWER MODULE POWER INPUT

The power to the module is directed through a low-pass filter network identified as the EMI Suppressor (refer to schematic Figure 4 and Figure 9) which is designed to reduce power-line conducted interference for conformity with applicable FCC regulations.

6.3 TROUBLESHOOTING POWER MODULE

Although the Power Module(s) have been designed for reliable trouble-free performance, an occasional failure may occur. SONICOR suggests that troubleshooting of Modules be limited to replacement of fuse, transistors and diodes. Should other components be suspected of being defective, SONICOR recommends replacing with a spare and returning the faulty Power Module to the factory. (See paragraph 4.4)

To trouble shoot transistors and diodes they must be removed from the circuit for proper analysis. Paragraph 6.5 and Table 3 page 38 should be consulted and observed before removal. Measurements can be made with a Simpson Volt Ohmmeter Model 260 with all readings plus or minus 20%.

6.3.1 TROUBLESHOOTING PROCEDURE

If the LED on the module did not operate (glow), the following basic procedure should be followed:

1. Test LED to insure it is operatable.
2. Check fuse limiting resistor.
3. If fuse is defective, check transistor.
4. If fuse and transistor(s) are defective replace fuse and transistors making sure that the transistors are a matched pair indicated by number written on transistor.
5. Test diodes to insure proper functioning.
6. Check over module to insure all connections are proper.

6.4 POWER MODULE CHECKOUT

To check all parameters and monitor the Power Module operation use of an oscilloscope and current probe are required. Figure 16 page 39 provides Test Instrumentation Schematic assistance.

WARNING: Current measurements should be attempted only by thoroughly qualified personnel since lethal voltages are present on the Power Module and equipment.

Typical oscilloscope displays associated with a normal power module is referenced in Display 1A. A power module with various possible abnormalities are referenced in Display 1B through 4B. For these displays, a good quality dual-trace triggered-sweep oscilloscope was used. The voltage trace were made by connecting the probe input to either of the voltage test loop

indicated on Figure 14 page 35. The probe output was connected to CH1 input of the oscilloscope. The current traces were obtained with a Tecktronix Model P6021 AC current probe connected to CH2. The probe is clipped around one of the 0-5 DC ammeter leads.

The DC current drawn by the power module can be measured by removing the Test Loop Jumper (See Figure 14 page 35) connecting a 0-5 DC ammeter to the quick-disconnect terminals. Be Sure To Return Jumper Wire When Completed.

Current measurements made in the field can be of questionable value since the reading is greatly influenced by the operating conditions of the cleaner tank. Such variable as mass and acoustic properties of the cleaning load, water temperature, water level and supply line voltage can cause this current to vary between 1.8 amps and 2.6 amps.

6.5 REPAIR AND REPLACEMENT TECHNIQUES

This section contains instructions for the removing and replacement of components on PCB.

6.5.1 COMPONENT REMOVAL

Cut the component from the circuit board. Using a long nose plier straighten remaining lead in PCB. Touch soldering iron to portion of lead remaining through back of PCB and with long nose pliers remove crimped ends. If holes are not clean, use the soldering iron and ice pick or a piece of wire to open the terminal hole. Before a part is unsoldered always note the position of the holes and if necessary tag the leads and location(s).

6.5.2 COMPONENT REPLACEMENT

When replacing a component, bend the leads to some shape as part that was removed making sure that it conforms to the hole pattern in the PCB. Insert component adjusting leads as required and bend to make contact with copper conductor. With the solder iron, and adequate solder, solder a firm electrical connection.

6.5.3 SOLDERING PROCEDURE

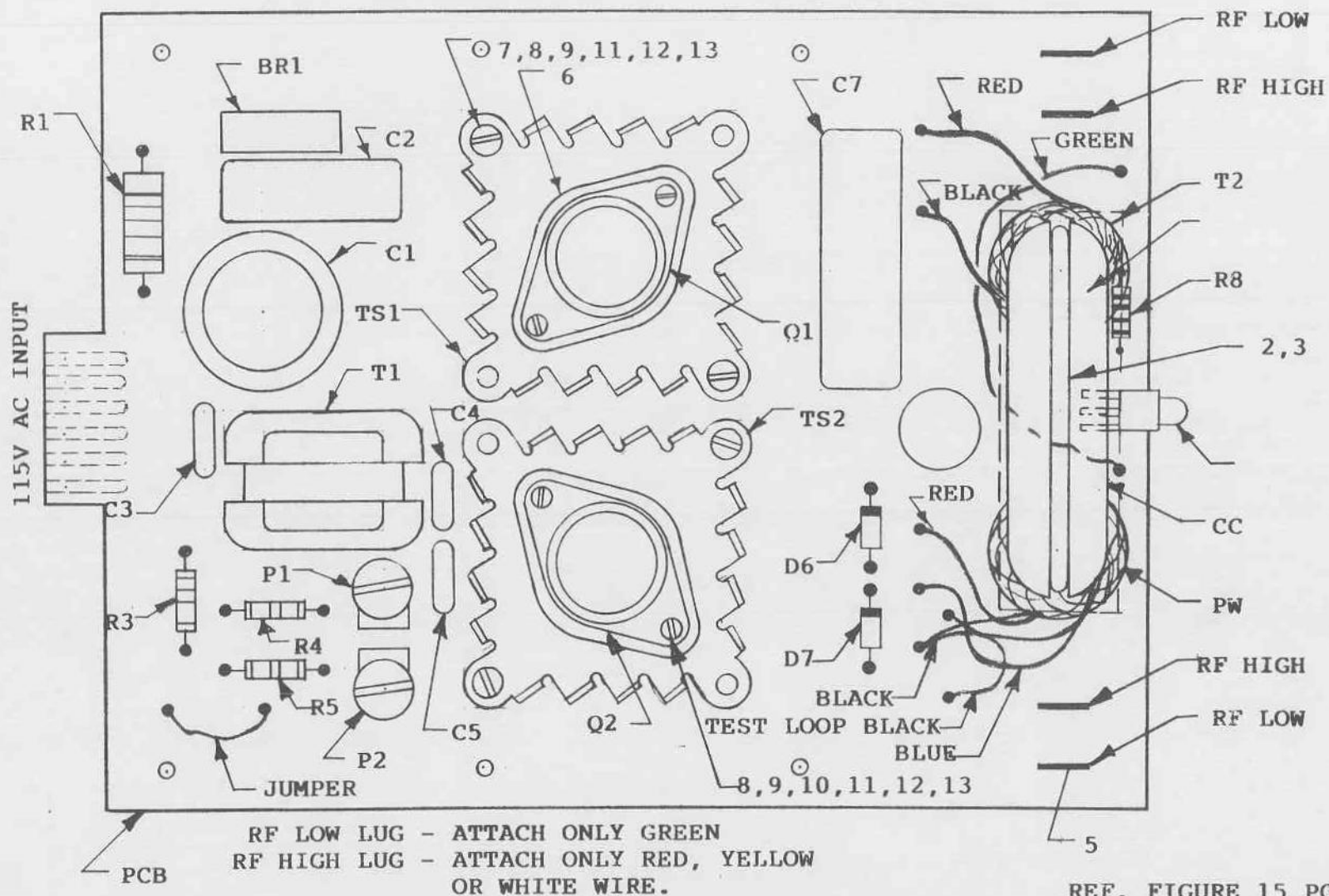
The heating time shall be held to a minimum to prevent damage. Apply the solder directly to the joint, not the soldering iron, and allow the solder to flow and become evenly distributed around the connection. Only that amount of solder necessary for a sound, well bonded connection is required. When mounting parts on printed circuit boards, solder shall fill holes and surround the component lead completely. Ensure that solder buildup on bottom side of printed circuit board does not extend more than 1/16".

CAUTION: Use only 60/40 resin core solder. Make sure soldering iron is clean and does not exceed 30 watts. Excessive heating of PCB copper conductor will lift and damage the printed circuit. When soldering components which are critical to heat, use long nose pliers to grip the leads between the component and the point of soldering.

6.5.4 REPAIR OF BROKEN COPPER CONDUCTOR LANDS

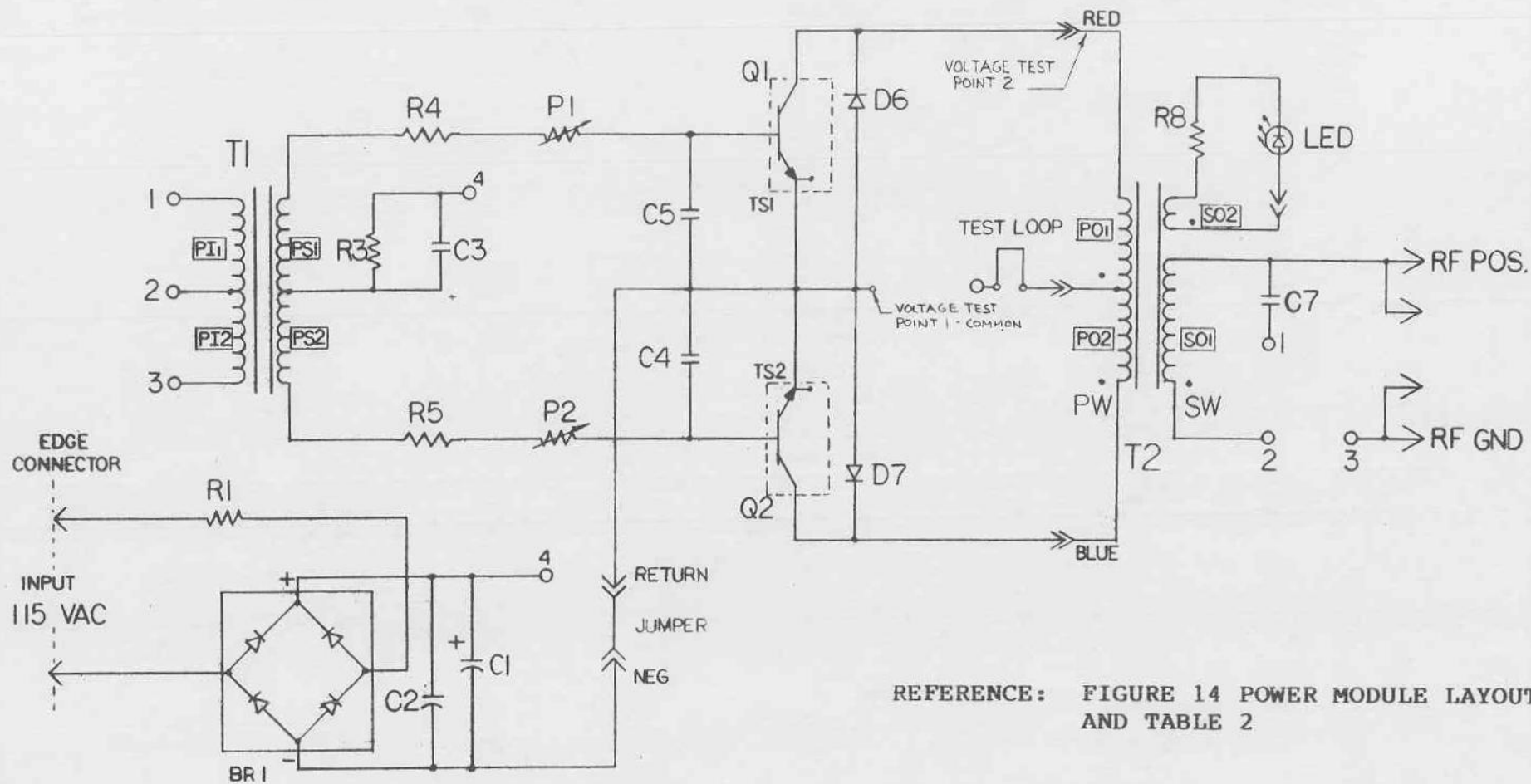
When repairing an open or damaged section of copper conductor on printed circuit board, use the bridging process described below:

- a. Using very fine sand paper, thoroughly clean the copper conductor on both sides of the break.
- b. Cut off enough bus wire to extend 1/8" past each side of the break.
- c. Solder the bus wire to the copper conductor and over the break, maintaining a smooth, unbroken fillet of solder on both sides of the bus wire so that it becomes part of the circuitry.



REF. FIGURE 15 POWER MODULE
SCHEMATIC AND TABLE 2

POWER MODULE ASSEMBLY P/N S420479
MODEL MSC-900T
FIGURE 14



REFERENCE: FIGURE 14 POWER MODULE LAYOUT AND TABLE 2

POWER MODULE SCHEMATIC
P/N S420479
FIGURE 15

REF. FIGURE 14 & 15

SYMBOL	DESCRIPTION	SONICOR PART NO	QTY PER ASSY
R1	.1 OHM FUSE	810154	1
BR1	PH40	800447	1
C2	2.2 UF	520044	1
C1	100 UF	520087	1
C3	.022 UF	520043	1
T1	35 13 2	S480329	1
C4	.022 UF	520043	1
C5	.022 UF	520043	1
P1	20 OHMS 3/4 WATT	810246	1
P2	20 OHMS 3/4 WATT	810246	1
R4	39 OHMS 1W	810343	1
R5	39 OHMS 1W	810343	1
R3	22K OHMS 1W	810111	1
D6	CRIF 040	800424	1
D7	CRIF 040	800424	1
C7	.015 UF 1600 VOLTS	520036	1
Q1	2N6675	800637	1
Q2	2N6675	800637	1
R8	33 OHMS 1W	810342	1
SW	SECONDARY COIL 68	S480470	1
PW	PRIMARY COIL 46	S480414	1

HARDWARE FOR FIGURE 14

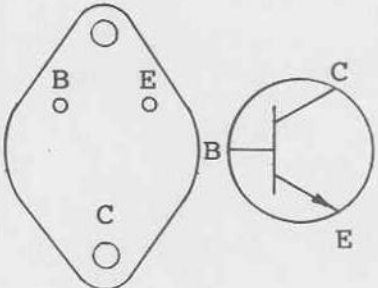
1	PLATE (ALUMINUM) 1 1/4X2 1/2X.080	F310046	1
2	U-BRACKET, BRASS	860079	1
3	NUT, ESNA NO. 6-32	860035	2
4	MALE TAB .111 QUICK DISCONNECT PCB	850047	8
5	MALE TAB .250 QUICK DISCONNECT PCB	850091	4
6	MICA	801613	2
7	INSULATOR (SHORT)	850671	4
8	SCREW NO. 4-40 X 5/8" LONG	860169	8
9	WASHER, NO. 4 EXTERNAL TOOTH	860178	8
10	INSULATOR (LONG)	850672	4
11	WASHER, NO. 4 INTERNAL TOOTH	860177	8
12	WASHER, NO. 4 FLAT	860174	8
13	NUT NO. 4-40	860171	8

REFERENCE FIGURE 14 AND FIGURE 15

POWER MODULE PARTS LIST

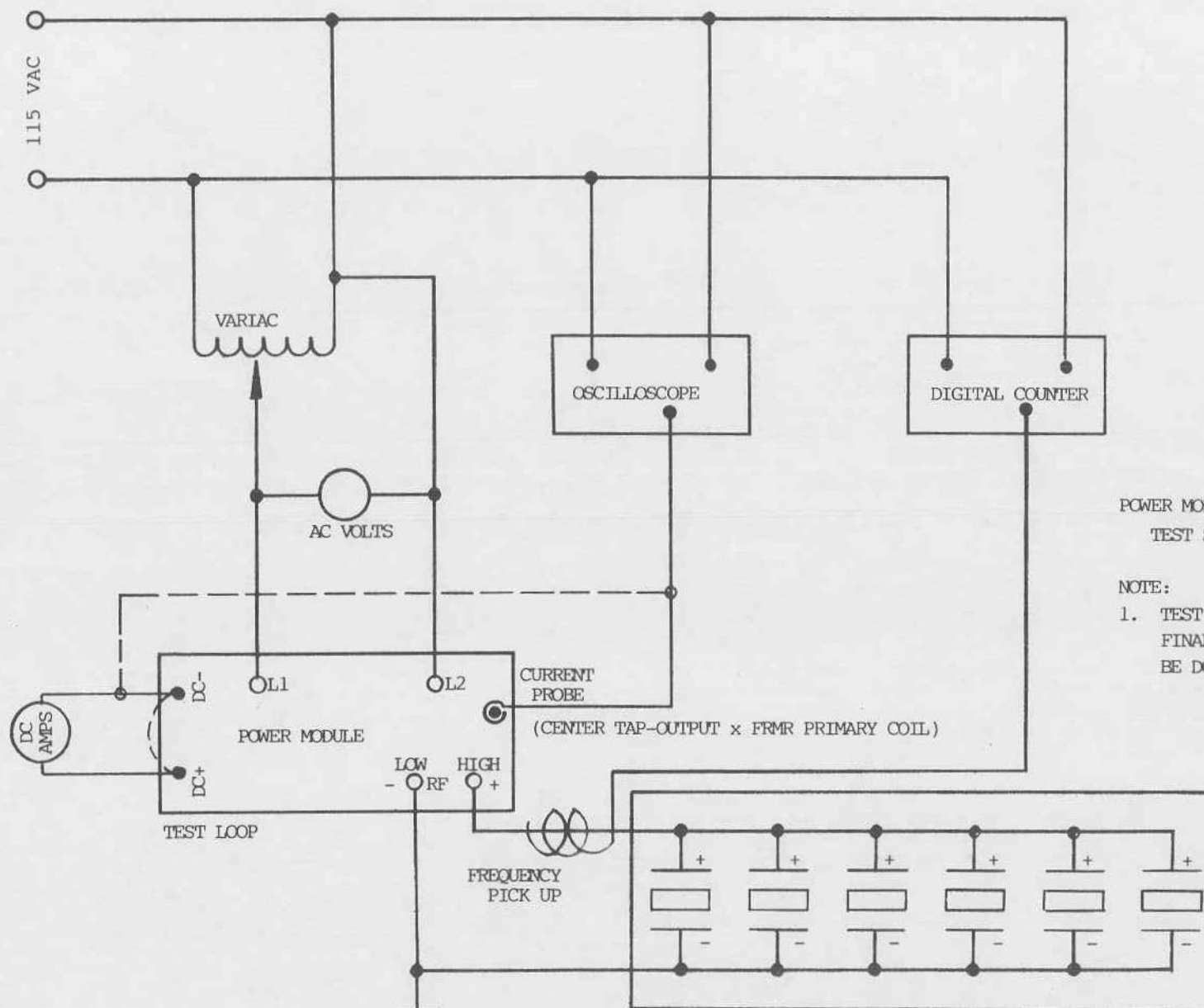
MODEL MSC-900T

TABLE 2

OHMMETER	POLARITY	RESISTANCE IN OHMS Scale - Rx100	REMEDIAL ACTION IF MEASUREMENT DOES NOT AGREE
+	—		
Collector	Emitter	High	Replace transistor 
Emitter	Collector	High	
Collector	Base	High	
Base	Collector	4-6	
Base	Emitter	4-6	
Emitter	Base	High	
Cathode	Anode	High	Replace diode  
Anode	Cathode	4-6	

NOTE: Meter function switch set to +D.C.

TRANSISTOR AND DIODE TROUBLESHOOTING CHART TABLE 3



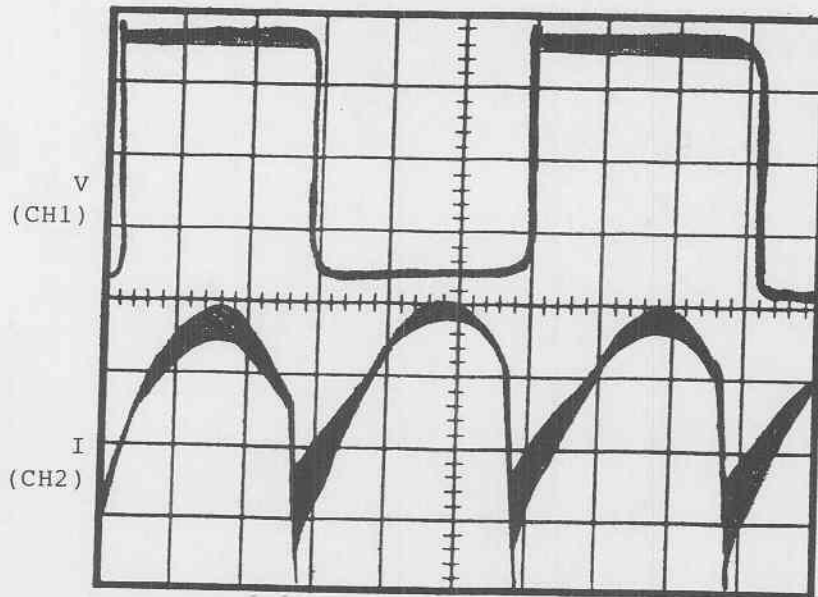
POWER MODULE INSTRUMENT
TEST SCHEMATIC

NOTE:

1. TEST TANK USED FOR PRE-TEST
FINAL TEST OF MODULE SHOULD
BE DONE ON CONSOLE TANK

TEST INSTRUMENTATION SCHEMATIC
FIGURE 16

DISPLAY IA

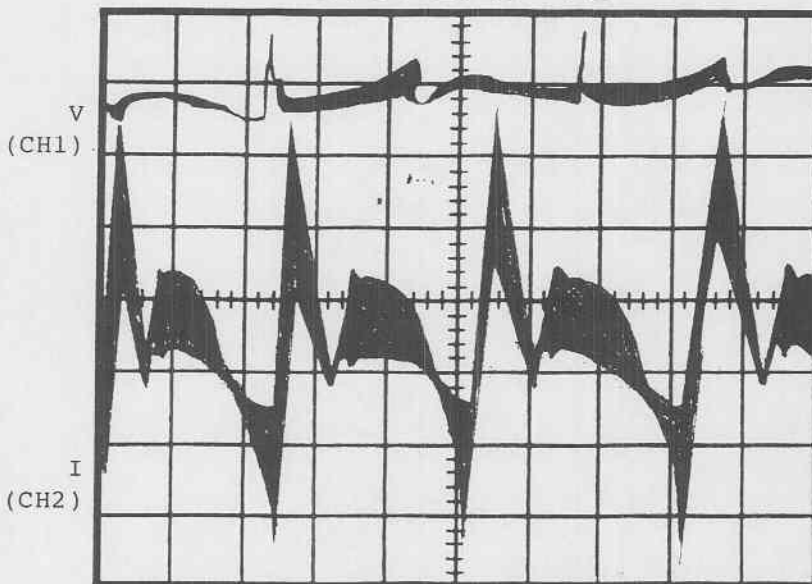


GOOD MODULE

SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 120 VAC
INPUT CURRENT 2-2.5 AMP D.C.

DISPLAY IB



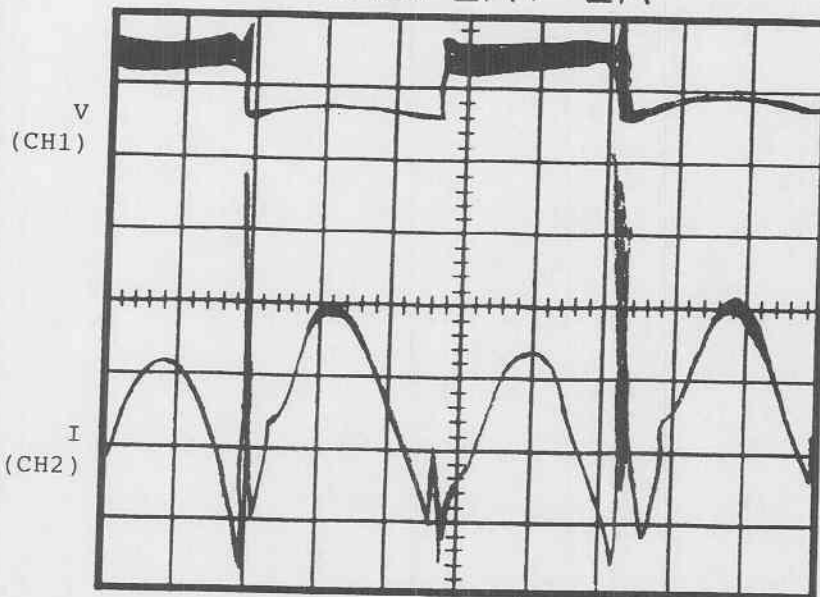
OUTPUT OPEN - CIRCUITED

SCOPE SETTING: CH1 = 5 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE .5 VAC
INPUT CURRENT 1 AMP D.C.

DISPLAY IA & IB

DISPLAY 2A

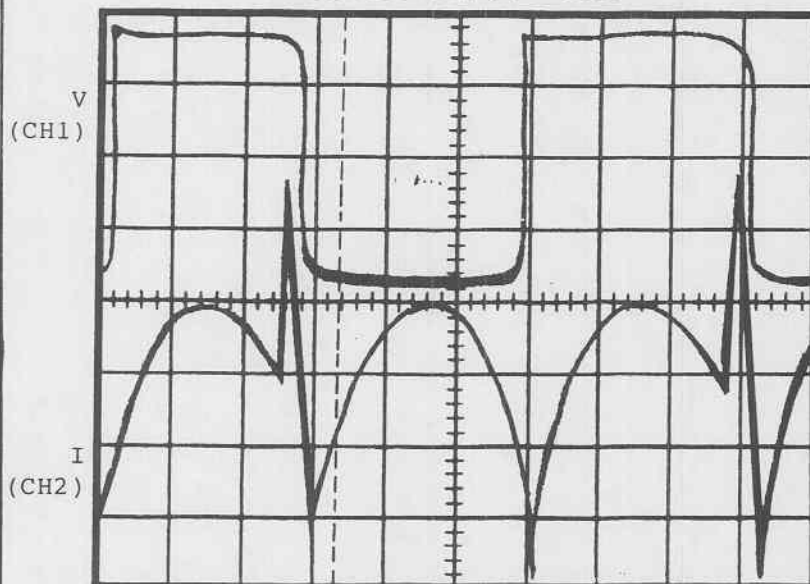


SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 100 VAC
INPUT CURRENT 2.2 AMP D.C.

DEFECTIVE LOAD: DAMAGED TRANSDUCER(S)
FRACTURED TRANSDUCER BOND(S)

DISPLAY 2B



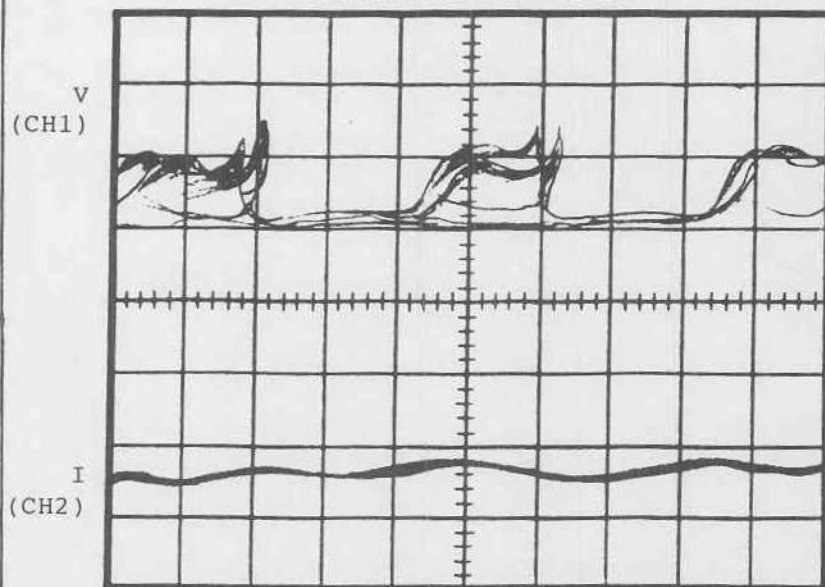
SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 120 VAC
INPUT CURRENT 2-2.5 AMP D.C.

MISMATCHED TRANSISTOR (Q1 or Q2)

DISPLAY 2A & 2B

DISPLAY 3B

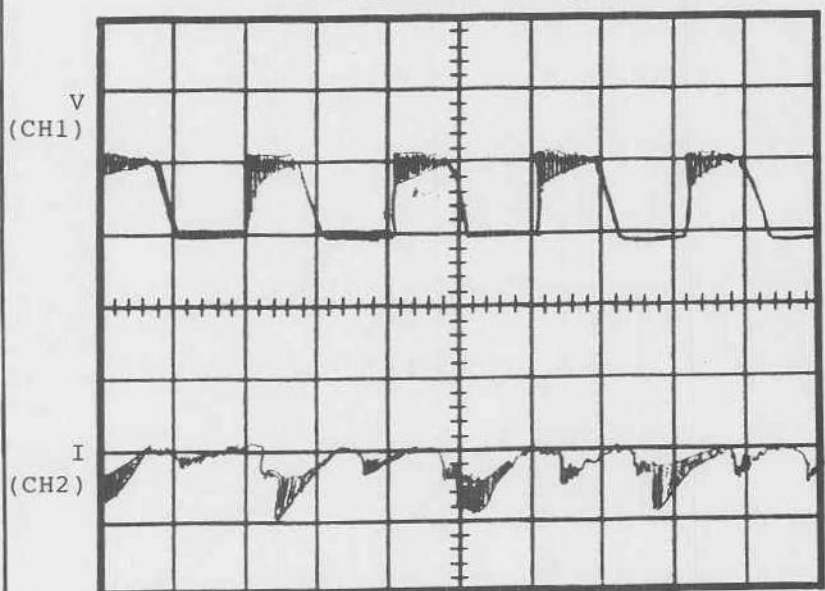


CAPACITOR C2 OPEN

SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 50 VAC
INPUT CURRENT .3 AMP D.C.

DISPLAY 3B



RESISTOR R3 or R4 OPEN

SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 50 VAC
INPUT CURRENT .2 AMP D.C.

DISPLAY 3A & 3B

DISPLAY 4A

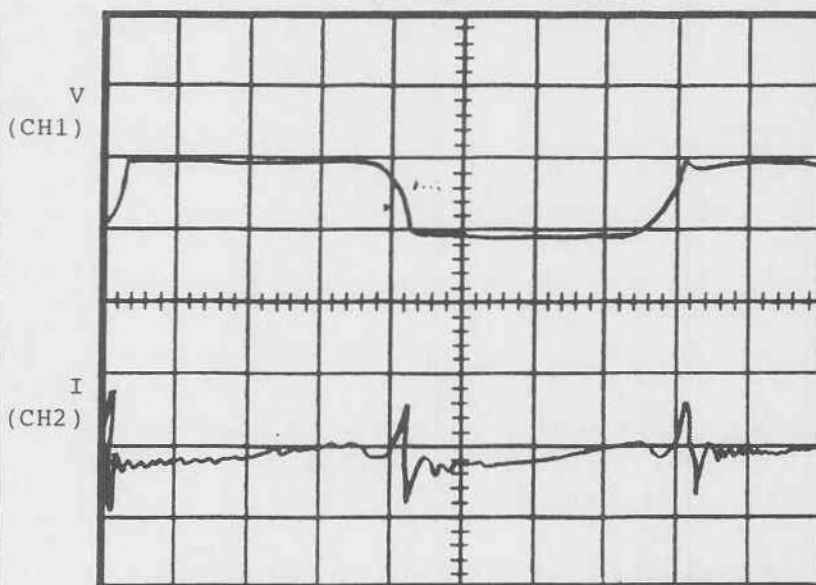


SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 50 VAC
INPUT CURRENT .4 AMP D.C.

OUTPUT TRANSFORMER
PRIMARY COIL (PW) OPEN

DISPLAY 4B



SCOPE SETTING: CH1 = 100 V/CM
CH2 = 1 AMP/CM
SWEEP = 5 US/CM

INPUT VOLTAGE 40 VAC
INPUT CURRENT 0 AMP D.C.

OUTPUT TRANSFORMER
SECONDARY COIL (SW) OPEN

DISPLAY 4A & 4B

SECTION VII

7.0 TRANSDUCERS

7.1 DESCRIPTION OF TRANSDUCERS

The SONICOR Lead-Zirconate-Titanate transducer is a ruggedly designed and constructed assembly providing high energy conversion and reliable performance requiring little or no service. The transducer Figure 17 page 47 is a sandwich type composite construction consisting of an aluminum radiating block, two LZT ceramic, a steel plated loading block and a 3/8" bolt with an insulator/ground lug. All transducers are wired in parallel in groups of six (6).

7.2 THEORY OF OPERATION

The generator Power Module provides electrical energy to the transducers. The electrical energy is converted by the transducer to mechanical sound energy transmitted through the tank bottom into the liquid. The phenomenon of cavitation is produced by sound waves passing through the liquid causing the foundation of millions of microscopic bubbles which collapse with pressure and literally blast contaminants free from the surface of the part.

7.3 ILLUSTRATED PARTS BREAKDOWN FIGURE 17 PAGE 47.

This illustrated parts breakdown list describes and identifies the parts of the transducer assembly.

7.4 TROUBLESHOOTING

CAUTION: Operation of the system without liquid in tank will lead to failure. The generator Power Modules provide sufficient power to cause heat damage to the transducer assembly and its bond. Never operate system without liquid in the tank.

7.4.1 Disconnect transducers (RF) wires from the transducers to the Power Module. Short the wires to ground to remove any static charge. Visually inspect wires and transducers for arcing at connection points.

Set ohmmeter scale to RX100K and connect across the transducer wires. It should read one megohm or higher. This test is good only for shorts caused by cleaning fluid leaks and will indicate broken, open wiring and/or defective transducers. If necessary remove tank from cabinet (paragraph 5.8) and visually inspect for any defective wiring arcing and/or debonding of transducers.

7.5 TRANSDUCER REPAIR

Repair and replacement of transducers should be accomplished only by thoroughly trained personnel or replace tank with a spare and return faulty tank to SONICOR (See paragraph 4.4)

7.6 TANK DISASSEMBLY FROM CABINET

Refer to paragraph 5.8.

7.7 REMOVAL OF LZT CERAMIC

1. Detach the wiring from the defective transducer.
2. Back out center bolt, remove elements from the assembly.
3. Examine the faces of the ceramic elements. If necessary, clean with very fine #400 grit paper. The grit paper should be placed on a flat, solid surface. The elements should be rubbed using a figure 8 pattern.
4. Discard any broken ceramic elements as well as those which cannot be properly cleaned with the grit paper.
5. All components must be kept absolutely clean. Do not allow any dirt to be trapped underneath or between components.
6. Clean elements with a clean soft cloth dampened with a chlorinated or fluorinated solvent.
7. Rebuild the transducer assembly. The positive face of the ceramic elements should be in contact with the electrode. The positive face may be identified by a black dot on the edge of the LZT ceramic.
8. Carefully center all the components and place the bolt through the center hole. The insulator should prevent contact between the bolt and the LZT ceramic. (Ref. Figure 17).
9. Tighten the bolt using a torque wrench to 500 inch-pounds.
10. Rewire the transducer exactly the way it was removed. (Ref. Figure 4 page 17)

7.8 TRANSDUCER ASSEMBLY REPLACEMENT

1. Make sketch of transducer(s) location and wiring. The transducers are wired into groups of six.
2. Detach the wiring from the defective transducer(s).
3. Remove the transducer assembly by heating inside of the Tank gently with a propane or other similar torch. At same time with hex wrench placed in bolt head gently apply pressure to the wrench breaking off transducer or work a putty knife or similar tool between epoxy and tank until transducer pops off. If removing only one or two transducers, extreme care should be exercised not to heat the area over the other transducer which would affect their bonds. It is better to remove all transducer in most cases.
4. Remove old epoxy from the Tank. Carefully scrape and burn the epoxy. Remove old epoxy from the transducer radiating surface by carefully sanding.
5. Clean tank surface with grit paper or sanding disc to remove final traces of epoxy and to roughen surface to obtain the best possible bond. If possible, the bottom of the tank and transducer radiating face should be sandblasted.
6. Wash the surface of tank and transducer radiating face with hot (about 120 degrees F), alkali cleaner (supplied with transducer adhesive kit) then rinse in hot water. Rubber gloves should be worn to protect hands. Work Carefully.
7. Once parts are cleaned and dried do not handle surfaces that are to be epoxied.
8. Spread a layer of epoxy on one side of the fiberglass disc. Place epoxy side of fiberglass disc on the tank. Carefully apply pressure to allow flow of epoxy and an even layer between the disc and the tank.

9. Spread a layer of epoxy on the transducer radiating surface. Place the transducer on the tank. Apply pressure evenly on the transducer, allowing for the removal of all air bubbles.
10. Tape in position using masking tape.
11. Cure in an oven at 185 degrees F (85 degrees C) for three hours -- longer times will have no ill effect.
12. Rewire the transducer(s) exactly the way it was removed.

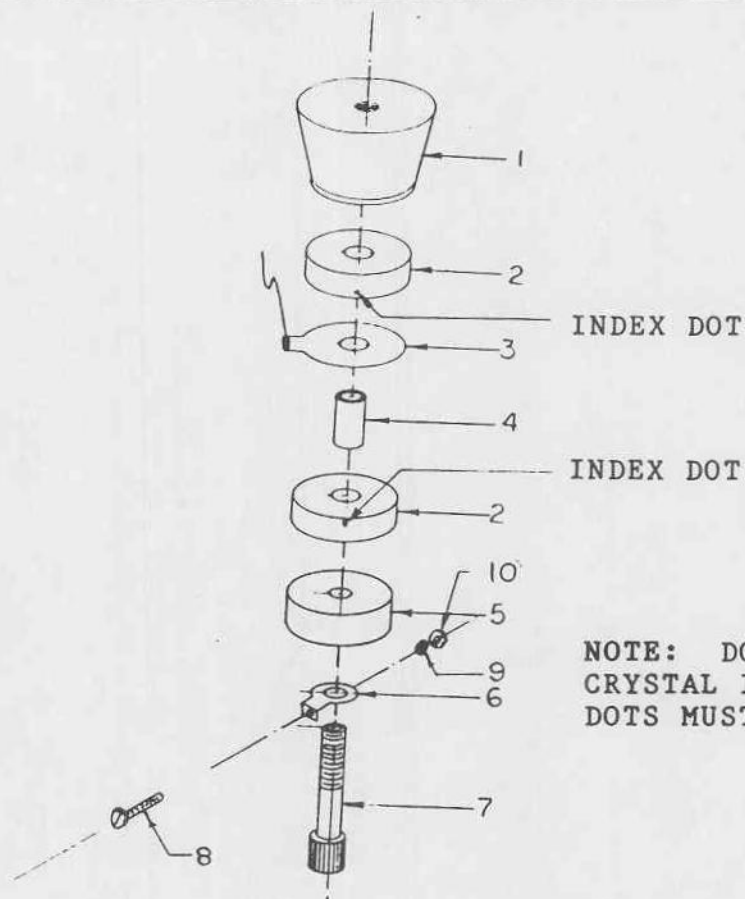


FIGURE & INDEX NO	PART NUMBER	DESCRIPTION	UNIT PER ASSY
17	S590151	TRANSDUCER ASSY	REF.
-1	F590142	RADIATING BLOCK	1
-2	590002	CRYSTAL ELEMENT	2
-3	S590120	ELECTRODE ASSY	1
-4	F590130	INSULATOR	1
-5	T590143	LOADING BLOCK	1
-6	F590149	GROUND LUG	1
-7	590132	BOLT 3/8-24x1 3/4 SOCKET HD	1
-8	860101	SCREW NO. 6-32x1/4" LONG	1
-9	860127	WASHER NO.6 INTERNAL TOOTH	1
-10	850221	NUT NO. 6-32 HEX.	1

TRANSDUCER ASSEMBLY
FIGURE 17

GUARANTEE

Your equipment has passed rigid quality controlled inspection at each stage of assembly. It has been life-tested under actual working conditions prior to shipment. The factory guarantees the equipment for one (1) year after date of purchase against failures due to defective material and/or workmanship. During the guarantee period, the factory will replace and/or repair any defective parts or defect in workmanship which may appear during normal and proper use of the equipment. Service and parts supplied by unauthorized sources will void the guarantee. During the guarantee period, there will be a handling charge only for repairs described above. Defective equipment must be returned prepaid to the factory. Collect shipments to the factory will not be accepted unless previously authorized.

The factory does not guarantee assemblies such as pumps and refrigeration units purchased from other manufacturers. The factory will honor the specific guarantee of the individual manufacturer involved.

There is no guarantee against cavitation erosion of Tank and Transducer surfaces, which is a normal occurrence and develops as a function of time in the operation of Ultrasonic Cleaning Equipment.

The factory does not honor the guarantee on equipment subjected to misuse, improper installation, alteration, neglect or accident.

No warranties, expressed or implied, have been made other than those stated herein. Seller hereby disclaims any warranty of merchantability or warranty of fitness for a particular purpose.